Town of Gilbert

Transportation Systems Management and Operations (TSMO) Plan

February 2021

Project #TS1930

gilbert

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Executive Summary

The Town of Gilbert has invested in technology, systems, and staff to support the operations and management of the Gilbert transportation network. However, the Town recognizes that there are opportunities to make better use of existing resources, pursue initiatives, and more effectively plan for future technology investments to improve the Town's transportation operations.

The Town of Gilbert's (Town) Transportation Systems Management and Operations (TSMO) Plan is an opportunity for the Town to map out a direction for the TSMO Program and plan a phased approach to improving traffic management, traveler information, incident management, inter-agency communications, and inter-departmental coordination to be more effective locally and regionally. TSMO strategies are often applied across a network or an organization, rather than an individual location, and many TSMO strategies require coordination across multiple departments, modes, and even jurisdictions. Examples of TSMO strategies include coordination activities such as traffic signal coordination, traveler information, special event management, integrated corridor management, work zone management, and traffic incident management. While many TSMO strategies require a technology component, the TSMO toolbox also includes business processes, collaborative activities or partnerships, and engineering solutions to optimize the mobility and reliability of the existing system using limited resources.

TSMO focuses on the *people, processes, and technology* involved in the *implementation, management, and maintenance* of the transportation network. TSMO is an approach to integrate planning and design with operations and maintenance to address both recurring and non-recurring congestion to maximize the safety, mobility, and reliability of the existing transportation network. While other planning efforts focus on planning the physical network and facilities that support mobility in Gilbert, the TSMO Plan focuses on planning, programming, designing and operating assets to actively manage the transportation network.

TSMO Vision, Mission, and Goals

The TSMO *vision, mission,* and *goals* are related but individually necessary to articulate what is intended to be accomplished and how it will be accomplished.

TSMO Vision

Improve safety and mobility for all modes of transportation by integrating planning, design, operations and maintenance activities that support the Town in striving to be a Town of the Future.

TSMO Mission

Work together as a Town to provide Gilbert residents and visitors with a proactive, responsive, and comprehensive transportation network that promotes quality of life and supports economic growth.

TSMO goals include:

- Data: Collect and utilize real-time data evaluated against performance metrics to support operational decision making and response to events.
- Customer Service: Deliver accurate and reliable traveler information to Town residents and the traveling public so they can make informed mobility decisions.
- Infrastructure: Make functional and cost-effective transportation infrastructure investments that serve safety and mobility purposes.
- Integration: Prioritize TSMO as a core objective in the agency's planning, design, construction, operations and maintenance activities of the transportation network to serve Town purposes as well as the role in the regional transportation system.

- Investment: Leverage opportunities to sustain funding, staffing, and infrastructure resources to support the operations and management of the transportation network and its assets.
- Consistency: Establish succession planning, documentation, and training in TSMO activities that creates the opportunity to improve what has been established over time.
- Efficiency: Implement projects that optimize existing transportation system capacity and alleviate congestion.

Involving Town Departments

To accomplish the level of stakeholder involvement desired for a TSMO Plan, Town staff representing many different departments and roles were invited to participate in stakeholder workshops and one-on-one or small group meetings to collect multiple perspectives and references on a variety of transportation topics.

The stakeholder input gathered through the various methods were reviewed and categorized into four main categories of *policies, projects, processes,* and *people* which encompasses the breadth and lifecycle of a TSMO Program. Overarching themes that resonated with most, if not all, Town departments included:

- Town staff are advocates for making changes and improvements that are in the best interest of the Town's residents.
- Department and project managers must utilize data and performance measurement to support data driven investments and decision making.
- Managers should seek to be lean smart, utilizing resources efficiently but effectively to achieve the Town mission and the missions of individual departments.
- The Town wants to implement appropriate latest and greatest technologies that have been tested and proven by others.
- Project teams should generate recommendations that are scalable and flexible to provide the ability to respond to the environment and conditions present when implementation is being pursued.
- Recommendations of the Plan should have clear owners/champions identified for implementation.

The TSMO Plan documents the current environment at the Town including a number of existing, programmed, and planned characteristics of the Town's assets, processes, and resources. The current environment also includes an examination of key dimensions influencing the Town's TSMO readiness including business processes, systems and technology, performance measurement, culture, organization and workforce, and collaboration.

Developing Strategies for Implementation

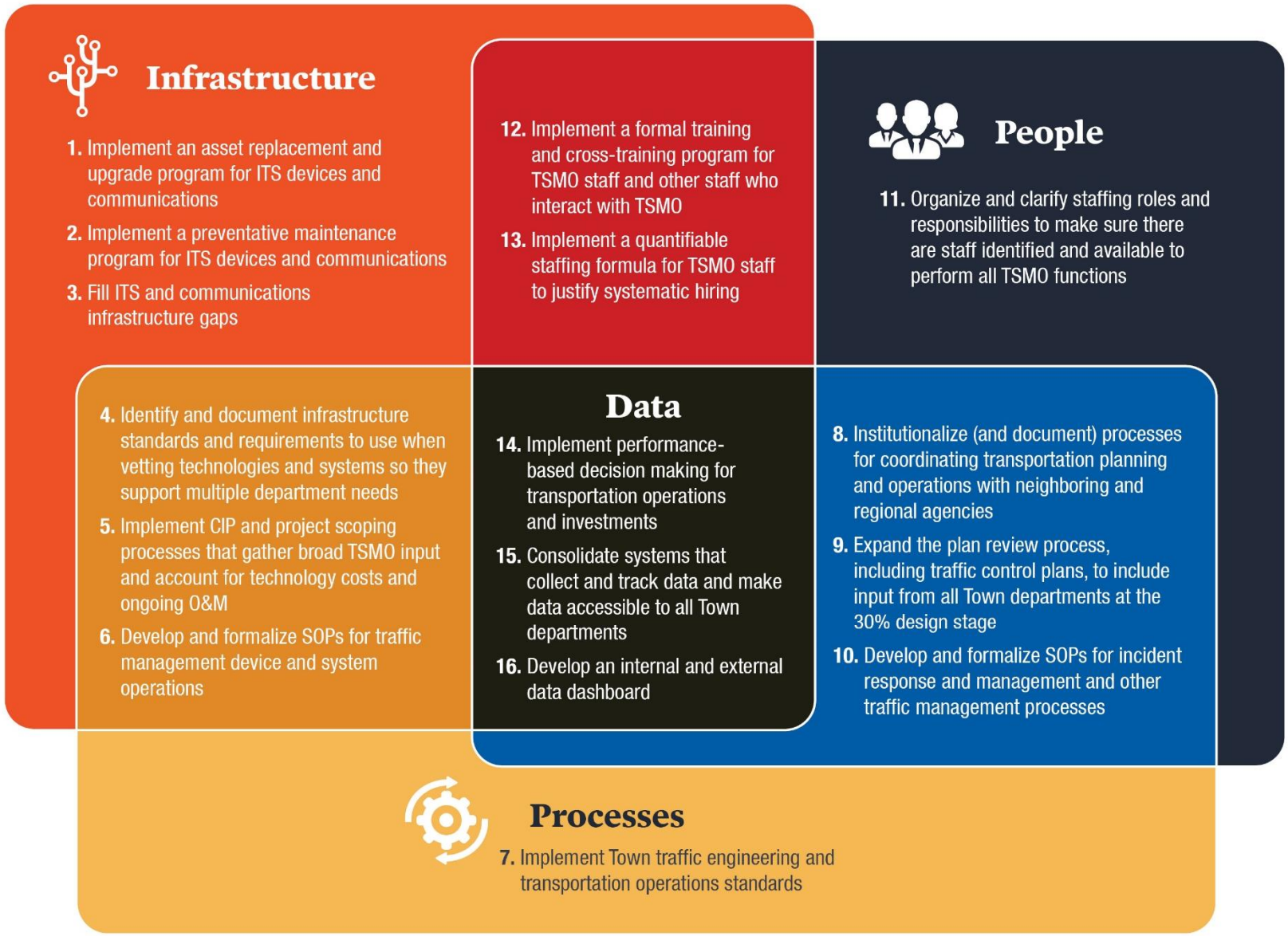
The Town's TSMO Strategies were developed based on the full set of policy, project, process, and people needs. The full range of strategies were then packaged to focus on strategies that span multiple/different needs categories and will help the Town take meaningful steps towards achieving their TSMO goals. The strategy categories – *infrastructure, processes, people,* and *data* – are similar to the original needs

categories but are more focused to illustrate the interrelation between strategies and how a TSMO focus requires investments in the 'overlaps' rather than looking at people, processes, or infrastructure in silos.

Focusing on the singular strategies alone will not result in the type of TSMO program that the Town envisions. Instead, a majority of the time and staff investment should go into those strategies identified in the overlaps between the categories. The overlapping strategies are those that are multi-departmental efforts to improve coordination and sharing of resources and data. Successful implementation of these strategies will help elevate many aspects of transportation operations and management in the Town and will help the Town make progress towards achieving their TSMO vision.

Each item in the Strategy Summary diagram is further detailed in the TSMO Plan, including the following in-depth information:

- Category of strategy and strategy title;
- Strategy description/actions or steps to take to implement the strategy;
- Deliverables or outcomes that should be expected when the strategy is completed;
- Items to consider when pursuing strategy implementation;
- Planning level costs;
- Recommended implementation timeframe (in process, near-term, mid-term, or long-term); and
- Responsible party, including both a lead department and other departments to support.



Gilbert TSMO Strategy Summary

Support for Implementation

It will be vital to the success of this TSMO Plan for Town staff to continue to coordinate within and between departments to deliver an integrated approach. It is important for Town representatives to stay appraised of regional initiatives or funding opportunities, build relationships and share information with other local and regional agency staff, and gain knowledge and skills related to the use and maintenance of technology.

While a majority of the strategies provided in the TSMO Plan will not require funding, there are some strategies that will require funding investments and should be included in the Town's CIP. These strategies utilize a variety of funding sources based on strategy owner and ultimate user. Possible resources and funding sources are provided to assist the Town in identifying funding opportunities and initiatives to participate in.

The Town of Gilbert TSMO Plan is a dynamic plan that focuses on current and future technology infrastructure, TSMO processes and plans that will impact TSMO functions within the Town as well as with other agencies. To be consistent with changing needs and evolving technologies, this Plan and the associated tools will require periodic updating and review as the TSMO Program continues to grow. As projects are implemented or expanded, as agency priorities change, or as other changes occur that impact technology and transportation operations in the Town, changes should be documented through an update to the TSMO Plan.

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List of Acronyms

ARID – Anonymous Re-Identification Devices
ATMS – Advanced Traffic Management System
ATSPM – Automated Traffic Signal Performance Measurement System
BCA – Benefit/Cost Analysis
CAD – Computer Aided Dispatch
CCTV – Closed-circuit television
CIP – Capital Improvement Project
FAST Act – Fixing America's Surface Transportation Act
FHWA – Federal highway Administration
FY – Fiscal Year
GIS – Geographic Information System
HSIP – Highway Safety Improvement Program
IMSA – International Municipal Signal Association
IP – Internet Protocol
IT – Information Technology
ITE – Institute of Transportation Engineers
ITS – Intelligent Transportation Systems
MAC – Media Access Control
MAG – Maricopa Association of Governments
MARK- 1 – Measurement, Accuracy, and Reliability Kit
Mbps – Megabits Per Second
O&M – Operations and Maintenance
PTZ – Pan, Tilt, Zoom
RACI – Responsible, Accountable, Consulted, and Informed
RSP – Roadway Safety Program
SM&O – Systems Management and Operations
SOP – Standard Operating Procedure
TIP – Transportation Improvement Program
TMC – Traffic Management Center
TOC – Traffic Operations Center
TOPS-BC – Tool for Operations Benefit Cost Analysis
TSMO – Transportation Systems Management and Operations
TSOP – Traffic Signal Optimization Program
VPH – Vehicles Per Hour

1. Introduction

The Town of Gilbert's (Town) Transportation Systems Management and Operations (TSMO) Plan marks an important step in the planning and continued evolution of the Town's transportation system. This TSMO Plan will help articulate the Town's vision and provide a roadmap to guide future decision making and investments as they relate to transportation operations. Leveraging the Maricopa Association of Government's (MAG) Systems Management and Operations (SM&O) Plan, the Town's TSMO Plan will add specific and unique recommendations that will inform future investments, resource development, and local operations.

The Town has invested in technology, systems, and staff to support the operations and management of the Gilbert transportation network. However, the Town recognizes that there are opportunities to make better use of existing resources, pursue initiatives, and more effectively plan for future technology investments to improve the Town's transportation operations. The TSMO Plan is an opportunity for the Town to map out a direction for the TSMO Program and plan a phased approach to improving traffic management, traveler information, incident management, inter-agency communications, and inter-departmental coordination to be more effective locally and regionally.

2. Vision, Mission and Goals

Having a clear and agreed-upon vision, mission, and goals for TSMO in Gilbert is critical to guide this TSMO Plan effort and help create direction for the TSMO Program at the Town. These three cornerstones are related but individually necessary to articulate what is intended to be accomplished and how it will be accomplished. TSMO goals, established prior to this project, have been adjusted as noted below to reflect the assessment of the Town's state of practice.

TSMO Vision

Improve safety and mobility for all modes of transportation by integrating planning, design, operations and maintenance activities that supports the Town in striving to be a Town of the Future.

TSMO Mission

Work together as a Town to provide Gilbert residents and visitors with a proactive, responsive, and comprehensive transportation network that promotes quality of life and supports economic growth.

TSMO Goals:

- Data: Collect and utilize real-time data evaluated against performance metrics to support operational decision making and response to events.
- Customer Service: Deliver accurate and reliable traveler information to Town residents and the traveling public so they can make informed mobility decisions.
- Infrastructure: Make functional and cost-effective transportation infrastructure investments that serve safety and mobility purposes.
- Integration: Prioritize TSMO as a core objective in the agency's planning, design, construction, operations and maintenance activities of the transportation network to serve Town purposes as well as the role in the regional transportation system.
- Investment: Leverage opportunities to sustain funding, staffing, and infrastructure resources to support the operations and management of the transportation network and its assets.
- Consistency: Establish succession planning, documentation, and training in TSMO activities that creates the opportunity to improve what has been established over time.
- Efficiency: Implement projects that optimize existing transportation system capacity and alleviate congestion.

3. Overview

TSMO focuses on the *people, processes, and technology* involved in the *implementation, management, and maintenance* of the transportation network.

TSMO is an approach to integrate planning and design with operations and maintenance to address both recurring and non-recurring congestion to maximize the safety, mobility, and reliability of the existing transportation network. While other planning efforts like the Integrated Mobility Master Plan focuses on planning the physical network and facilities that support mobility in Gilbert, the TSMO Plan focuses on planning, programming, designing and operating assets to actively manage the transportation network.

TSMO strategies are often applied across a network or an organization, rather than an individual location, and many TSMO strategies require coordination across multiple departments, modes, and even jurisdictions. Examples of TSMO strategies include coordination activities such as traffic signal coordination, traveler information, special event management, integrated corridor management, work zone management, and traffic incident management. While many TSMO strategies do require a technology component, the TSMO toolbox also includes business processes, collaborative activities or partnerships, and engineering solutions to optimize the mobility and reliability of the existing system using limited resources.

The Town will benefit from the TSMO Plan because it:

- Establishes a consistent approach for succession planning, through development of a roadmap that can be followed regardless of staff changes over time.
- Identifies incremental steps for small wins that create momentum in the near-term.
- Contains cost-effective strategies for projects as well as processes, policies, or guidelines that allow the departments work together.
- Allows for data-driven decisions in the use of performance metrics and data for justification and evaluation of projects.
- Leverages multiple funding sources to identify funding opportunities that support transportation investments outside of traffic-specific funding sources, which could create multi-departmental benefits.
- Coordinates Town resources to avoid duplication of efforts and achieve increased efficiency in the expenditure of resources and staff time.

4. Assessment Process

As part of the early needs identification, an assessment of the Town's current capabilities was prepared using available data, studies, and input from stakeholders. Figure 1 shows the various types of data and steps that were used to assess the current state of the Town relative to its goals.

Figure 1: Needs and State of Practice Process

To accomplish the level of stakeholder involvement desired for a TSMO Plan, Town staff representing many different departments and roles were invited to participate in stakeholder workshops and one-on-one or small group meetings to collect multiple perspectives on a variety of transportation topics.

Within each of these departments and divisions, stakeholders were selected to represent differing levels within the organization, including:

- Leadership: Department Directors, Town administration, and other leadership representatives that can provide oversight and institutional knowledge.
- Management: Department Managers related to transportation or ITS that deal with day-to-day challenges and constraints.
- Operations and Field Personnel: Operators and practitioners within applicable Town departments related to transportation that serve as the day-to-day implementers and maintainers.

Stakeholder Workshop #1 was held on May 20, 2020 via a Microsoft Teams online meeting and was attended by a total of 35 Town representatives. One-on-one and small-group meetings with representatives from individual departments and divisions were held between May 12, 2020 and June 18, 2020 for more detailed discussions related to the department's interaction with the transportation network. Stakeholder Workshop #2 was held on June 22, 2020 via a Microsoft Teams online meeting and was attended by a total of 27 Town representatives from various departments.

4.1 Needs, Issues, and Opportunities

The stakeholder input gathered through the various methods were reviewed and categorized into four main categories of *policies, projects, processes, and people* which encompasses the breadth and lifecycle of a TSMO Program.

Overarching themes that resonated with most, if not all, Town departments include:

Policies	Projects
Laws, regulations, standard, council direction	Specific projects that address TSMO needs and priorities
Processes	People
Operations processes, procedures, alignment with Town requirements	Staffing and workforce development, training, skill building

- Town staff are advocates for making changes and improvements that are in the best interest of the Town's residents.
- Department and project managers must utilize data and performance measurement to support data driven investments and decision making.
- Managers should seek to be lean smart, utilizing resources efficiently but effectively to achieve the Town mission and the missions of individual departments.
- The Town wants to implement appropriate latest and greatest technologies that have been tested and proven by others.
- Project teams should generate recommendations that are scalable and flexible to provide the ability to respond to the environment and conditions in place when implementation is being pursued.
- Recommendations of the Plan should have clear owners/champions identified for implementation.

A summary of the TSMO Program needs, issues, and opportunities categorized into the four categories of policies, processes, projects, and people which are provided in the *Stakeholder Coordination and Needs Assessment* provided in Appendix A. The needs and opportunities were collected through stakeholder input as well as a preliminary evaluation of the Town's inventory and processes by the project team.

4.2 State of Practice

The *State of Practice* report provided in Appendix B documents a number of existing, programmed, and planned characteristics of the Town's assets, processes, and resources.

Asset Inventory – This includes an inventory of existing intelligent transportation system (ITS) devices and other existing, but underutilized, infrastructure that support (or could support) TSMO in the Town of Gilbert. ITS includes communications and field technologies that are integrated into the transportation network such as traffic signals, cameras, fiber optic communications, and central management software.

TOC Analysis – This includes an analysis of the Town's existing Traffic Operations Center (TOC) including the existing network equipment, software used, and processes used by operators and managers.

Staffing – This is an evaluation of the Town's current staff levels specific to TSMO functions with a focus on management, planning/programming/funding, project development/design, operations, and maintenance perspectives.

Existing Processes – This is a detailed review of the Town's existing processes as related to budgeting and funding, inter-departmental collaboration, regional collaboration, data, external information dissemination, planned and unplanned events, streets maintenance, and staff training.

Existing References and Documents – This is a summary of existing documents, processes, and plans that the Town has utilized to guide activities over time.

Programmed Infrastructure and Systems – This is a summary of programmed infrastructure and systems included in the Town's Capital Improvement Program (CIP) and the MAG Transportation Improvement Program (TIP) as well as ongoing projects that require specific coordination including the Fiber Optic Strategic Build Out, Integrated Mobility Master Plan, Streets Long-Range Infrastructure Planning, and the Town's Broadband Project.

Best Practices – This is an evaluation of best TSMO practices, particularly those identified from comparably sized agencies in the MAG region, and a comparison to the Town's overall "state" of managing a TSMO program and the assets involved.

Capability Maturity Model (CMM) Assessment – This is a summary of the CMM workshops conducted to assess key dimensions influencing the Town's TSMO readiness including business processes, systems and technology, performance measurement, culture, organization and workforce, and collaboration.

5. Strategies

TSMO strategies were developed based on the full set of policy, project, process, and people needs in the *Needs Assessment* document and review of the Town's resources, capabilities, and assessment in the *State of Practice* document against the vision, mission and goals.

An initial set of strategies were vetted with the Town's Project Management Team and subsequently with those Town Departments that are directly impacted to make sure there was both support and accountability to pursue implementation of each strategy. The full suite of strategies were presented to all Town stakeholders to give each an opportunity to review and provide input on any TSMO strategies that they may be involved with or may impact their business processes.

The focus for this Plan are the strategies that not only address a need but will help the Town take meaningful steps towards achieving their TSMO goals. This approach resulted in strategies that were packaged to address multiple needs or that spanned the different needs categories.

Figure 2 provides a summary of the recommended strategies and how they relate to each other. The strategy categories – infrastructure, processes, people, and data – are similar to the original needs categories but are more focused to illustrate the interrelation between strategies and how a TSMO plan requires investments in the 'overlaps' rather than looking at people, processes, or infrastructure in silos.

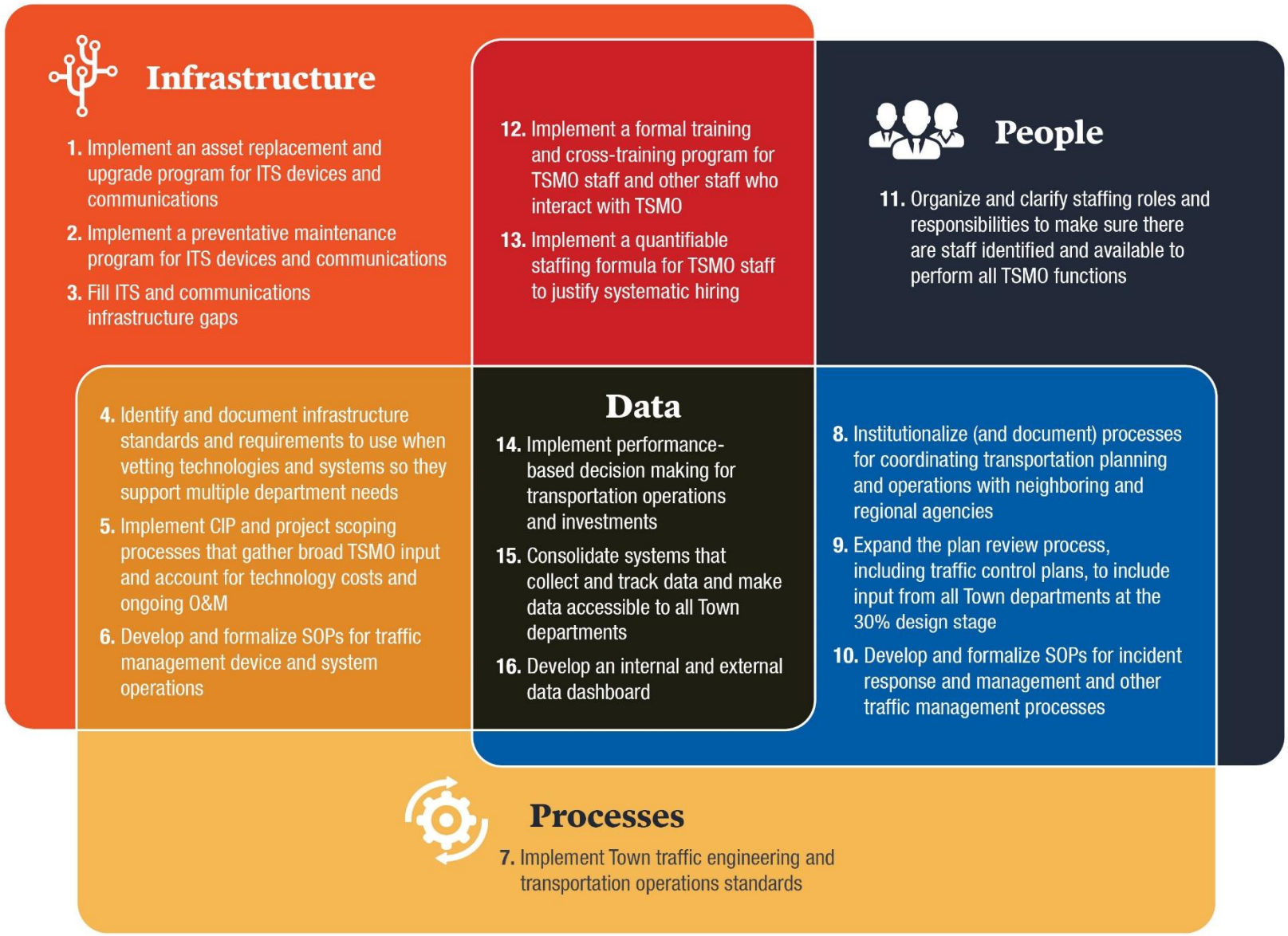

Figure 2: Gilbert TSMO Strategy Summary

This document provides more details on the six strategies that are associated with a single strategy category. These strategies will generally be completed by a single department, often have a capital cost associated, and are important for creating a foundation for the Town's TSMO program to build off. The information in this document will provide the Town with sufficient detail to pursue funding for these strategies through both local and regional funding sources.

However, focusing on these singular strategies alone will not result in the type of TSMO program that the Town envisions. Instead, the majority of the time and staff investment should go into the strategies identified in the overlaps between the categories. The overlapping strategies are those that are multi-departmental efforts to improve coordination and sharing of resources and data. Successful implementation of these strategies will help elevate many aspects of transportation operations and management in the Town and will help the Town make progress towards achieving their TSMO vision.

Each item in the Strategy Summary diagram is detailed in Appendix C which includes more in-depth information on how to implement the strategy:

- Category of strategy and strategy title;
- Strategy description/actions or steps to take to implement the strategy;
- Deliverables or outcomes that should be expected when the strategy is completed;
- Items to consider when pursuing strategy implementation;
- Planning level costs;
- Recommended implementation timeframe (in process, near-term, mid-term, or long-term); and
- Responsible party, including both a lead department and other departments to support.

One of the most critical aspects of the approach to TSMO strategies is that every strategy has a committed champion or lead who has been empowered and equipped to pursue completion of the strategy. Every strategy was vetted with the department or team of departments that are identified as the lead, and a commitment has been made by those departments to take accountability and ownership of the strategy and pursue its completion over time.

5.1 Infrastructure

The Town's technology assets for serving TSMO functions are already quite robust. The Town has 213 signalized intersections, up-to-date traffic signal controllers, technology to collect data on the transportation network that is in good condition, and almost 75 miles of fiber optic communications cabling connecting the entire transportation network. An assessment of the Town's current infrastructure, ages of assets, and ability to strategically collect data was conducted, and some areas of improvement were identified. Based on this assessment, three infrastructure-specific strategies are recommended:

- 1. Implement an asset replacement and upgrade program for Intelligent Transportation System (ITS) devices and communications
- 2. Implement a preventative maintenance program for ITS devices and communications
- 3. Fill ITS and communications infrastructure gaps

Table 1 summarizes and provides additional implementation details for the Infrastructure strategies.

Table 1: Infrastructure Strategies Summary

Strategy	Description/Actions	Deliverable/ Outcome	Considerations	Timeframe & Updates	Responsible Party
1. Implement an asset replacement and upgrade program for ITS and communications	Review asset management plan provided in appendix and develop annual budgets accordingly.	Formalized asset replacement program and budget	• Work with Finance to try and get an ITS asset management budget line item as part of annual budgets, rather than having to request it each year. • Surprise and Mesa may be good agencies to reach out to get information.	Near-term	Lead: Traffic/ Traffic Operations Center (TOC) Support: Finance
2. Implement a preventative maintenance program for ITS devices and communications	Review maintenance guidelines provided in appendix and create a maintenance schedule for the field devices and communications equipment. There may be cases where there is a need for a higher-level of maintenance requested for a device or system than identified in the proposed maintenance program, such as for CCTV cameras, where Police and Fire may request more frequent maintenance than can be afforded by current TOC staffing. • Discuss how other departments can support the TOC to provide an elevated level of maintenance that may be desired. • Document any resource-sharing agreements through an MOU or other formal agreement.	Formalized ITS maintenance program Inter-departmental agreements for resource sharing for maintenance, as necessary	• Need adequate staffing levels to accomplish maintenance (Strategies 11 and 12). • Consider training/cross-training with Streets and/or Information Technology (IT) staff to support level of maintenance service desired (Strategy 13).	Near-term Agreements should be revisited as needs or resources of the TOC or other departments change	Lead: TOC Support: IT, Police, Fire
3. Fill ITS and communications infrastructure gaps	Implement new devices or communications at locations where there may be gaps – see Figure 3.	New devices	• See where infrastructure can be included in a Capital Improvement Program (CIP) or development project. • Make sure technologies are in line with decisions made related to standards and requirements for equipment (Strategy 6). • Make sure to include new technologies or systems into preventative maintenance and asset replacement programs (Strategies 1 and 2).	Varies	Lead: Traffic/ TOC Support: IT

Strategy 1: Implement an Asset Replacement and Upgrade Program

The Town currently has three funded projects through the MAG Transportation Improvement Program (TIP) that will provide federal funding for ITS equipment and will satisfy most of the replacement needs for technology at major intersections throughout the Town. All three funded projects were combined together for programming in the fiscal year (FY) 2020 cycle. Because the exact assets that will be replaced using the FY2020 federal funding have not yet been identified by the Town, Appendix D provides a detailed breakdown of recommended assets shown in Figure 3 that should be replaced with the TIP funding based on the known ages of equipment at each intersection location.

Asset Replacement Program – Phase 1 (FY2020) – Includes replacement of ten closed circuit television (CCTV) cameras and upgrade of 23 major intersections to video detection that provides turning movement counts for vehicles as well as data collection for bicycles, and pedestrians.

Asset Replacement Program – Phase 2 (FY2021) – Includes replacement of ten CCTV cameras and upgrade of 20 major intersections to video detection that provides turning movement counts for vehicles as well as data collection for bicycles, and pedestrians.

Asset Replacement Program – Phase 3 (FY2022) – Includes replacement of ten CCTV cameras and upgrade of 20 major intersections to video detection that provides turning movement counts for vehicles as well as data collection for bicycles, and pedestrians. If there are remaining funds after the asset replacement needs for CCTV and upgrades to video detection are met, it is recommended that the Town use the remainder of the Phase 3 funding to replace some emergency vehicle preemption (EVP) equipment.

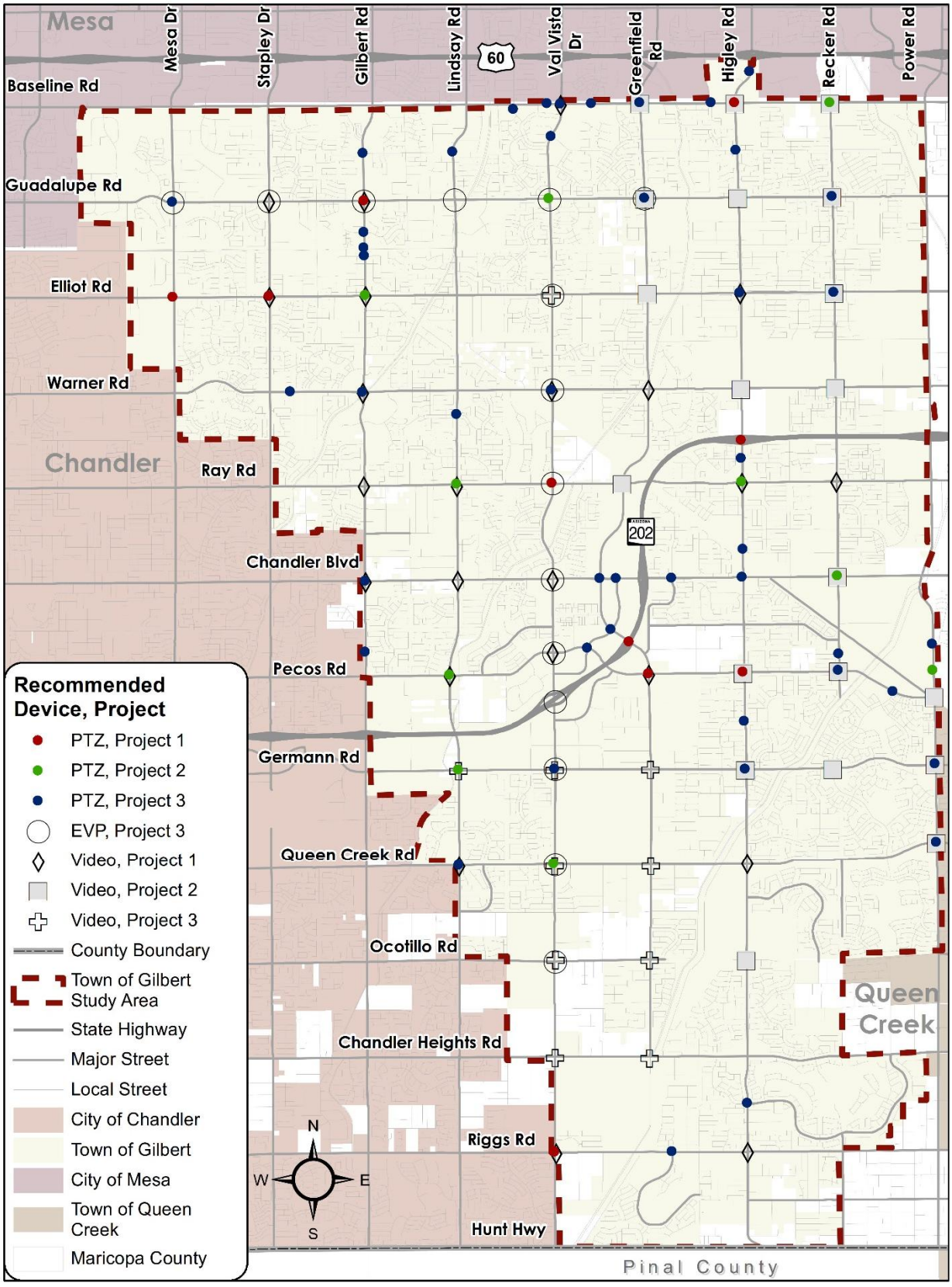

Figure 3: Asset Replacement Program – Phase 1, 2, and 3

Although Town staff has been able to acquire federal funds for asset replacement for some equipment in FY2020, FY2021, and FY2022, that funding source for asset replacement cannot be considered sustainable year-after-year. Outside the currently programmed equipment replacement, it is recommended that the Town establish a formal asset management program for ITS and transportation communications. This involves both the personnel resources as well as the required funding resources. This section captures the recommendations from the funding resource perspective, and Section 4 People captures the personnel resource recommendations.

There is currently no formal asset management funding program or processes in place for technology managed by the Town's TOC. In other Town departments, there are asset management programs established for assets such as IT equipment, pavement, and streetlights.

The Ongoing Asset Management Program spreadsheet tool, provided in Appendix D, was developed to support realistic planning and budgeting for transportation technology. The spreadsheet tool takes capital and operations and maintenance (O&M) costs and normalizes them annually. The unique lifecycle timeframe and expected service life for each device asset type are assessed for a 30-year timeframe; once infrastructure reaches its lifecycle timeframe, it is recommended that it be replaced. A yearly replacement budget is approximated based on all device assets and their expected lifecycles throughout the Town. The spreadsheet tool will show which devices, and how many of each, need to be considered for replacement/upgrading for the upcoming fiscal year or for 30 fiscal years in the future. This allows the Town to ensure their assets are up-to-date, reliable, and fully-functioning.

The asset replacement recommendations within the initial few years is based on an evaluation of the age of existing assets, which resulted in a larger number of replacements needed up front, with a more balanced number in subsequent years . The spreadsheet tool helps in tracking device assets, identifying devices that require replacement, and captures the infrastructure that the TOC and Streets needs to be aware of and to plan for appropriately.

The tool also provides the Traffic Engineering and Streets departments with the information that they will need to establish an ongoing TSMO asset replacement program that, on average, will provide the necessary funding to support both existing assets as well as future forecasted assets:

- Annual Maintenance Costs for TOC Assets:
    - $181,000 (existing) to $212,000 (future)
- Annual Capital Replacement Costs for TOC Assets:
    - $540,000 (average of year over year individual costs forecasted from 2021 through 2050)

Establishing an ongoing asset replacement program for TOC assets will enable the Town to have the necessary resources to support maintenance and will allow the Town to explore other funding sources to support new initiatives and expansion of Smart City or broadband initiatives. An active asset inventory also allows the Town to evaluate tradeoffs between maintaining equipment versus replacing it based on lifecycle.

Strategy 2: Implement a Preventative and Responsive Maintenance Program

Transportation technology and communications elements already in place throughout the Town's transportation system require unique maintenance needs as compared to traditional transportation infrastructure. Putting proper effort toward maintenance activities will support device/infrastructure

reliability and effective operation and will protect the agency's investment in technology and communications and enable the TSMO program to adapt to changing conditions.

Maintaining technology and communications elements is important because malfunctions can critically affect the system's ability to perform their intended functions. Having technology and communications elements fail to function could negatively affect traffic safety, public perception, and transportation network capacity. Failure of the system also has the potential to cause measurable economic loss and increases in congestion, fuel consumption, emissions, and traffic collisions.

Operations and maintenance considerations should be evaluated before implementing a technology; for example, a life-cycle cost analysis may show benefits to using higher priced components in order to reduce regular maintenance costs. Operations and maintenance extends beyond simply keeping the equipment working. Reacting to emergency failure conditions, maintaining accurate maintenance logs, and conducting preventative maintenance programs all require highly skilled and fully-trained staff. A maintenance management system can track failures and decrease the time needed to repair the failures.

The number of devices and systems that need to be maintained throughout the Town will continue to increase and need to be appropriately maintained and effectively operated to provide accurate, reliable, and timely information. The maintenance plan proposed in this section recommends criteria for replacement and preventative maintenance and the need for on-going support for devices and systems. To attain full system potential, the Town should also consider the staff resources necessary to perform maintenance activities as much as the hardware and software itself.

The following maintenance types should be considered for each type of asset:

- Preventative Maintenance – *What to do to prevent failure* – This encompasses a set of checks and procedures performed at scheduled intervals including: inspection, record keeping, cleaning, and replacement.
- Responsive Maintenance – *What to do when something fails* – This is the initial reply by field maintenance staff to an ITS subsystem or malfunctioning device. Responsive maintenance includes minor maintenance activities, major maintenance activities, and major rehabilitation/upgrade activities.

The recommended maintenance cycles are based on general guidelines, rather than presented as required activities, to allow the Town to identify areas where maintenance activities could be introduced based on resource availability. The need for full replacement or upgrade may be required if the device has experienced frequent malfunctions, failures, or has reached lifecycle expectancy and it is more cost-effective to replace the technology rather than to continue to maintain it. Any replacements or upgrades would be handled by the Asset Replacement Program in Appendix D.

Preventative Maintenance

Preventative maintenance is performed to ensure the reliability and longevity of the mechanical and electrical operations of the system and will reduce failures in equipment, responsive maintenance, road user costs, and liability exposure. Preventative maintenance involves repetitive upkeep to allow devices and systems to operate efficiently and effectively to maximize the operating lifespan of ITS devices.

There are three types of preventative maintenance that ITS devices require in order to fulfill their intended design for operations and lifecycle:

- *Minor Maintenance* – Minor maintenance includes tasks that can be carried out without large scale testing or the use of heavy equipment. It includes visually inspecting and checking many items, elementary testing, cleaning, lubricating and minor repairs that can be accomplished with hand tools or portable instruments;
- *Major Maintenance* – Major maintenance includes extensive testing and overhauling, and replacement of components that require a scheduled down time, and often the use of bucket trucks and other heavy equipment; and
- *Major Rehabilitation* – Major rehabilitation or complete replacement, is contemplated for devices that experience frequent malfunctions or failures.

Appendix E identifies the frequency of minor and major maintenance, major rehabilitation, and lifecycle timeframes for a range of technology and communications infrastructure. The recommendations are based on the Institute of Transportation Engineers (ITE) and the International Municipal Signal Association (IMSA) maintenance guidelines that Town is encouraged to utilize. The ITS Device Maintenance Guidelines will need to be updated as new technologies are implemented or devices are upgraded to incorporate the increased reliability that may be involved with the implementation or upgrade.

As the Town's technology and communications infrastructure continues to grow over time and maintenance efforts increase, the Town will need to expand and formalize their preventative maintenance program to include additional devices, including new types of devices and systems that are deployed. A formalized program, including documented processes and regular training, is particularly important to have in place as new staff is added to support the growth. The Town should review and revise the preventative maintenance checklists outlined in Appendix E on an annual basis to ensure new issues are being addressed.

Responsive Maintenance

Responsive maintenance includes the steps to be taken when a device fails unexpectedly such as who is responsible in responding to the failure/issue, what equipment is available to troubleshoot or repair the failure/issue, and procedure for repair. Responsive maintenance activities should be supported by appropriate personnel trained to install replacement parts, target repair times by device type, and coordination with others in terms of expected downtime or disrupted access to device data or images.

As additional and new types of devices and systems are implemented, including new field devices and the TOC, the department who is responsible for tracking the various assets should keep a detailed inventory of responsive maintenance activities that have occurred in the Lucity asset management system. The following standard operating procedures should be tracked for technology assets in Lucity:

- Detection;
- Work order creation;
- Dispatched resources;
- Response activities;
- Diagnosis;
- Interim repairs; and
- Work order close out.

This tracking will allow staff to identify devices that are not reliable, not accurate or have had frequent malfunctions. The tracking will also allow the Town to identify appropriate cases for technology replacements where maintenance of an existing technology may be more costly than upgrading to a newer technology.

Strategy 3: Fill ITS and Communications Infrastructure Gaps

The Town has developed a robust system of technology assets to operate and manage the transportation network. The areas of improvement for the Town from an infrastructure perspective include developing a standard for technology deployment along major corridors that have been deployed in a somewhat ad hoc manner, filling remaining gaps of technology where needed to meet that standard, and identifying new technology not utilized today to improve all modes of travel.

Standardized Intersection Technology for Major Corridors

This section provides a detailed look at equipment and the appropriate layout for technology at signalized intersections along major corridors, primarily focusing on the locations where major streets cross with other major streets. Establishing a standard layout for technology at intersections sets the expectation for data collection as required by the Town's TOC. Benefits of making a technology standard for major intersections are increased economies of scale, improved maintenance experience/time, and improved Town uniformity.

Components of standardized technology at signalized intersections may include a traffic monitoring camera, vehicle detection (capable of collecting turning movement counts), advanced radar detection, Anonymous Re-identification (ARID) devices, communications (radios/antennas/fiber), switches, and emergency vehicle preemption. The recommended standardized intersection technology elements are shown in Figure 4.

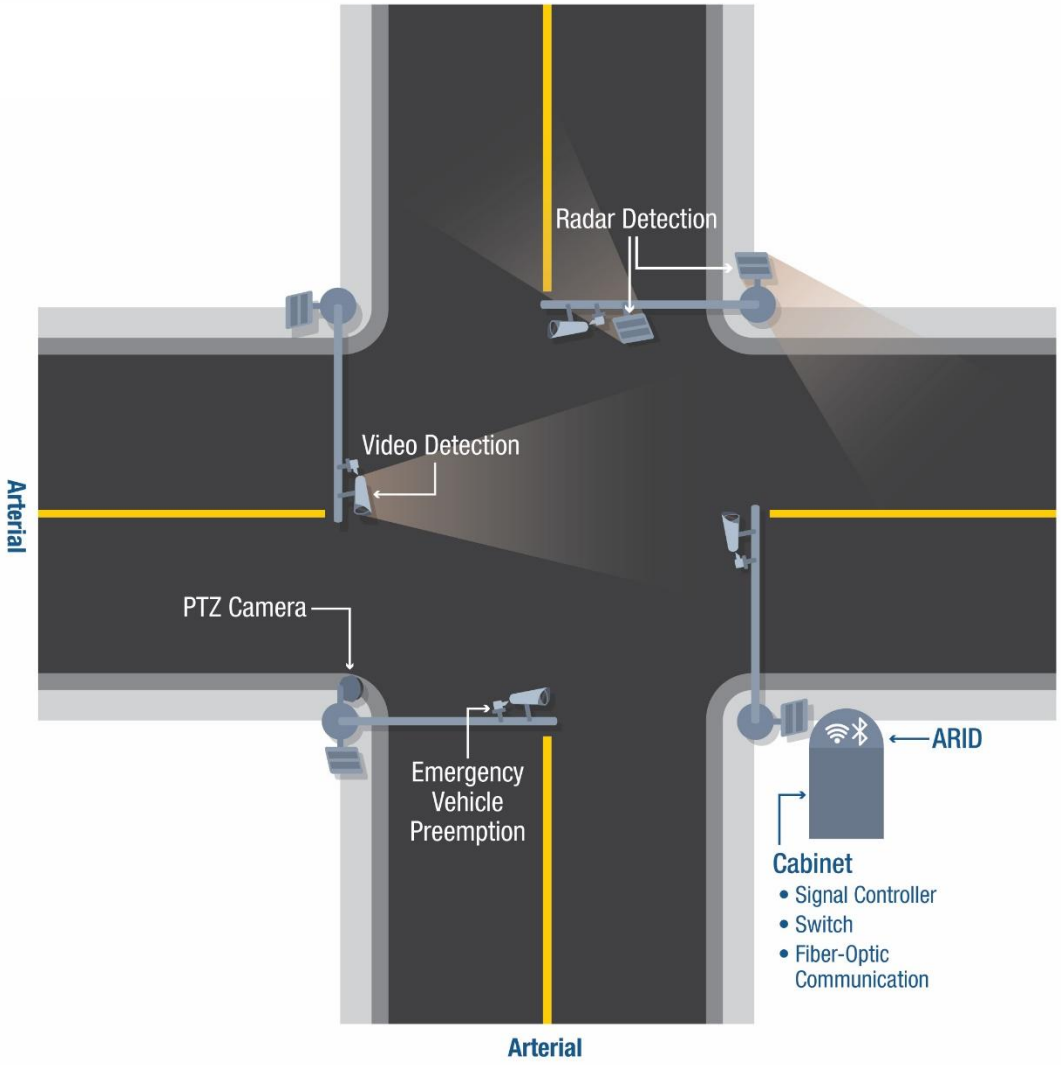

Figure 4: Standardized Intersection Technology

Traffic Monitoring Camera – All traffic monitoring cameras throughout the Town should be pan-tilt-zoom (PTZ) type, closed-circuit, high-definition, and communicate via internet protocol (IP). One traffic monitoring camera should be deployed at each signalized intersection throughout the Town.

Intersection Vehicle Detection – Intersection vehicle detection should be provided by non-intrusive methods, either video or radar technologies, and should replace current inductive in-pavement loop detection where possible. The intersection vehicle detectors should be able to detect and discriminate between vehicles, bicycles, and pedestrians on each approach to the intersection and should also have the ability to collect turning movement counts.

Advanced Radar Vehicle Detection – Advanced radar vehicle detection can provide a vehicle estimated time of arrival to an intersection and traffic volume data to support enhanced signal operational capability. This equipment should be placed on the signal mast arm along each major approach facing upstream, although alternative placement can be on the pole facing approaching traffic parallel with the mast arm.

Anonymous Re-Identification (ARID) – ARID devices collect anonymous travel time information from vehicles passing through the sensor area using Wi-Fi or Bluetooth technology. This detects the media access control (MAC) address of smartphones or other communication enabled devices from one location to another. One ARID device should be deployed at every major signalized intersection.

Communication – Fiber optic communication cable is the preferred communications medium to connect signalized intersections and other technology throughout the Town, where possible. If fiber optic communications cabling is not feasible at a major signalized intersection, wireless radios (with antennas) should be used to connect back to the nearest fiber cabling. As the Town's fiber optic communications network expands, intersections and devices should continue to be connected to the Town's fiber network.

Switch – An ethernet switch is a communication device that allows remote access to a traffic signal controller as well as other devices connected at that signalized location. One Ethernet switch is required at each signalized intersection and should be capable of accepting optical transceivers for communications over fiber-optic cable. Switches should have a minimum of eight 100 Megabits per second (Mbps) ethernet ports for other devices connected to the traffic signal infrastructure.

Emergency Vehicle Preemption – Emergency vehicle preemption for traffic signals allows for emergency vehicles to travel through intersections with increased safety and arrive to their destinations faster. When the emergency vehicle approaches the intersection, the system will extend the green time or change the timing schedule to give the emergency vehicle a green light. Emergency vehicle preemption should be placed on the signal mast arm along each major approach facing upstream.

Primary Capital Project to Fill Gaps

A technology inventory for intersections throughout the Town identified 68 intersections (out of 213) where an existing intersection does not meet the recommended standard where major streets cross with other major streets.

The Town already has three years of asset replacement projects already funded through the MAG TIP which will help address some of the gaps in infrastructure. There are remaining needs to install, replace, and/or upgrade technology infrastructure to standardize all major intersections throughout the Town.

The additional devices to fill the remaining gaps for major intersections is summarized in Table 2, detailed in Appendix F, and shown in Figure 5. These costs assume the Town will procure and install all devices as part of a single project for the Town to incorporate into their CIP. Costs were based on using recent unit bid costs for comparable equipment and overhead administrative fees typically associated with capital projects.

Table 2: Primary ITS Capital Project Summary

Type	Quantity	Location	Unit Price	Total
CCTV	1	Val Vista Drive / Chandler Heights Road	$5,500	$5,500
ARID	2	San Tan Village Parkway / Loop 202 and Queen Creek Road / Ranch House	$3,400	$6,800
Advanced Detection	54	Intersections not currently equipped with those devices as shown in Figure 4	$6,250	$337,500
SUBTOTAL				*$349,800*
Administrative Costs	1	ADOT Review Fee and Town Internal Costs	$40,000	$40,000
TOTAL				$389,800

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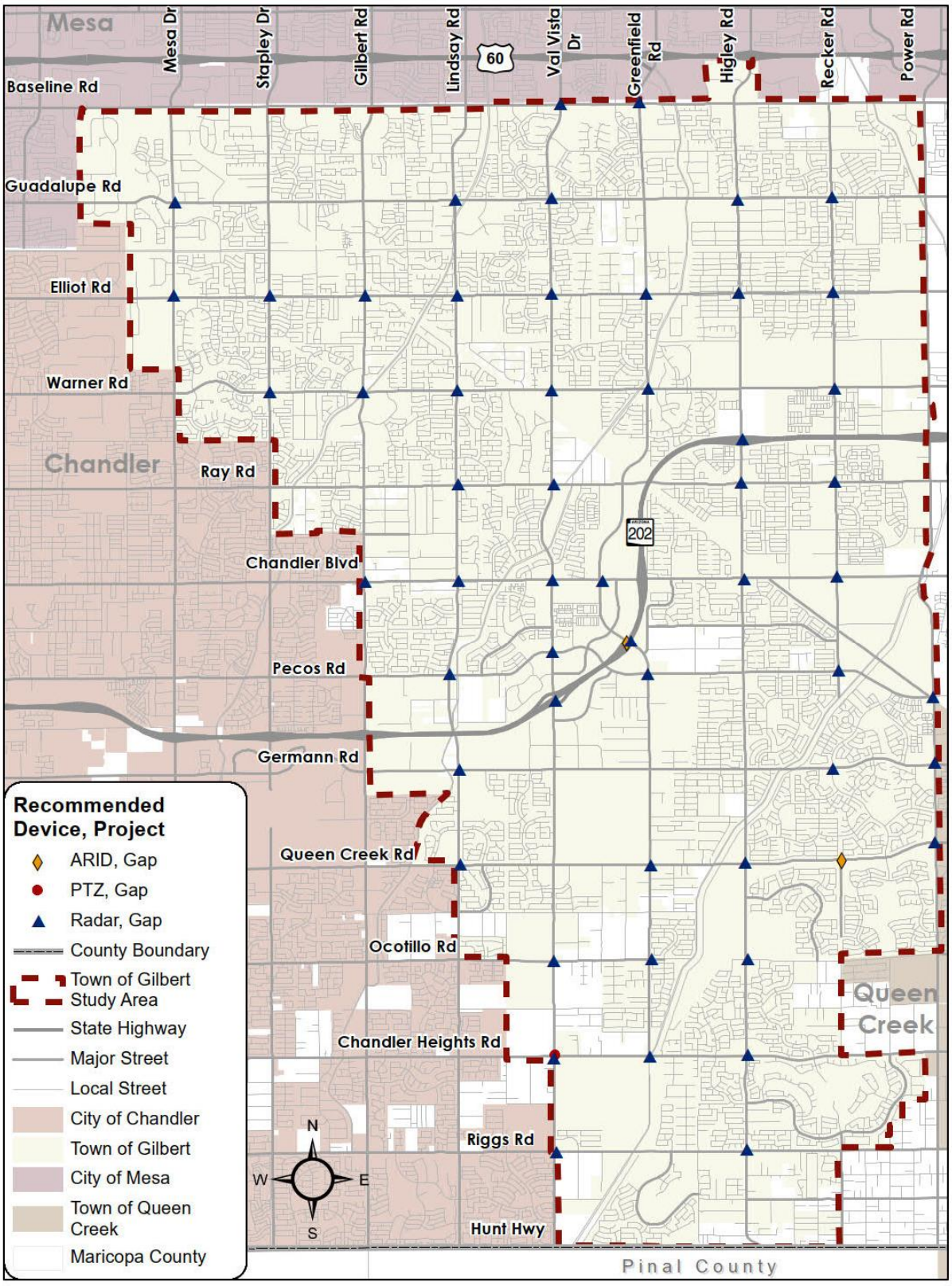

Figure 5: Primary ITS Capital Project

New Technology to Improve Other Travel Modes

Reliable data guides decision making and helps shape communities. Current and emerging technology can aid in collecting, processing, and using a variety of data by the Town. Understanding where people want to travel, whether via walking, bicycling, or transit, helps improve the overall transportation network and community. Good data helps plan and create better facilities and makes sure the facilities are located in places where the demand is greatest.

While there is generally good infrastructure in place to support collection of vehicle data, there is less robust data for active transportation and transit modes. Understanding how many people are utilizing current active transportation and transit infrastructure is critical in determining where and what improvements may be needed to accommodate a larger transportation network in the future.

A *Safety Improvements for Trail Crossings Study* was completed in 2020 that documented the existing trail crossings and recommended physical improvements to trail crossings with regard to safety and mobility. As there were no data collection recommendations within that study, in order to collect data to determine the public use of the trail crossings, it is recommended that the Town Transportation Planning group leverage Town-owned equipment to perform manual/temporary counts that collect pedestrian and bicycle data at key areas throughout the Town. These data collection locations that will help to inform where to deploy permanent data collection devices and where to start programming projects and funding in order to expand, create safer, and provide a better transportation system for all users. These devices could be owned and maintained by the Traffic/ITS group but would be initially purchased by and data would be used by Transportation Planning. It is recommended that the Town invest and install in automated video imaging to collect bicycle and pedestrian count data specifically at locations that are not already provided with vehicle detection. Thermal imaging may accomplish similar results and may also be used. An automated video imaging system includes the following components:

- Sensor – the device that detects pedestrians or bicyclists (a variety of technologies may act as the sensor).
- Counter/Processor – the part of the device that receives information from the sensor and determines whether or not a detection should be recorded.
- Data Logger – the part of the device that records each detection and may include other data (time of detection, hourly totals, etc.).
- Power Supply – the battery, permanent electrical connections, solar panel, etc. that powers the system.
- Communications – the part of the system that transfers data to the database (methods include a hard connection (connecting a laptop or memory card) wireless connection, or cellular modem.
- Physical Security – the physical housing or cabinet that houses the system.
- Data Management – any additional data management software specific to the counting technology.

Benefits of automated video imaging include:

- It is versatile and can be used in the short- or long-term duration and in a variety of areas: trails, sidewalks, bicycle lanes, roadway crossings, etc.;

- It is a non-intrusive technique for collecting data; and
- Compared to other common counting methods, it requires average equipment and preparation costs, minimal installation and data collector training time, and can be mobile (temporary or permanent)[1].

The Town should consider installing automated video imaging equipment that collect bicycle and pedestrian data at locations that either already equipped with vehicle detection devices or are not already being upgraded by the Asset Replacement Program Phases 1, 2, and 3 to detection devices that can collect bicycle and pedestrian data. The following potential locations (shown in Figure 6) were chosen based on areas that experience high pedestrian and bicycle use along trails per the collected information presented in the 2019 Bike Gilbert Plan.

- Western Canal/Western Powerline Trail;
    - Intersections with McQueen Road, Cooper Road, Gilbert Road (downtown area), Lindsay Road (Freestone Park area);
- Consolidated Canal/Heritage Trail;
    - Intersections with Elliot Road, Warner Road, Ray Road;
- Eastern Canal/San Tan Vista Trail;
    - Intersections with Guadalupe Road, Elliot Road, Warner Road, Val Vista Drive, Germann Road;
- Roosevelt Water Conservation District East Maricopa Floodway/Marathon Trail;
    - Intersections with Pecos Road, Germann Road, Queen Creek Road (to capture Gilbert Regional Park Area), Chandler Heights Road;
- San Tan Village Area;
    - Intersections of Williams Field Road and San Tan Village Parkway, Ray Road and San Tan Village Parkway;
- Downtown Area; and
    - Intersection of Gilbert Road and Elliot Road.

The total cost for the active transportation data collection locations is $300,000 which includes a camera at 30 trail crossing locations out of the total 46 trail crossings. For cost calculations, it was assumed that each location currently has a pole that a camera could be mounted to so the cost would only include the unit and processing. The costs assume the Town will procure and install all devices as part of a single project. Costs were based on using recent unit bid costs for comparable equipment and overhead administrative fees typically associated with capital projects.

[1] National Cooperative Highway Research Program (NCHRP) Report 797, Guidebook on Pedestrian and Bicycle Volume Data Collection

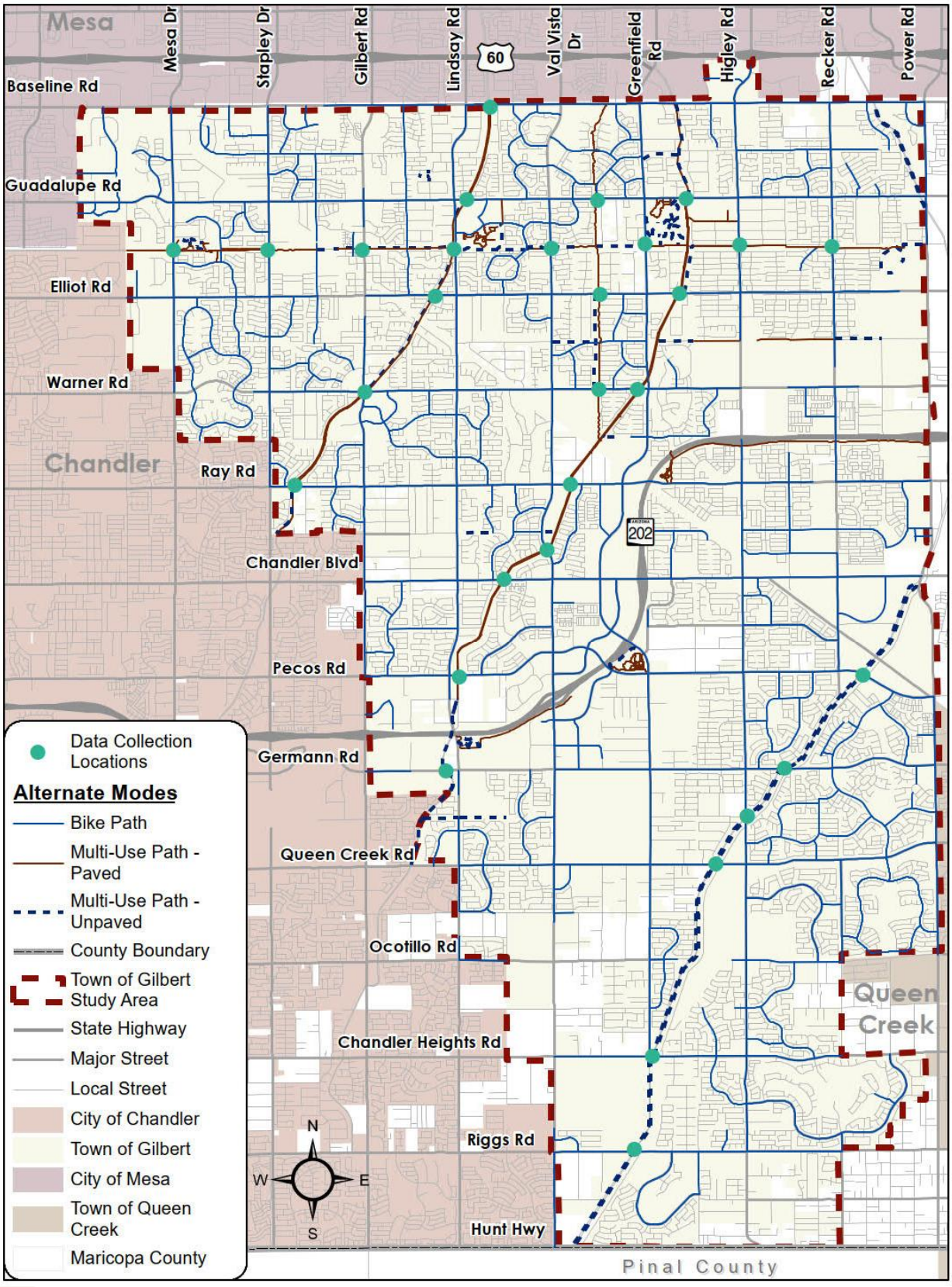

Figure 6: Recommended Active Transportation Trail Data Collection Project

As the Town's data collection program continues to develop and grow, other active transportation and transit data activities may be worth considering. These techniques or devices offer the ability to collect data and/or interact with focused user groups in the future:

- *Wayfinding systems provide information and signage* that help guide people through an environment. The environment may consist of the entire town, a downtown area, park/trail system, etc. The systems may include communications including mobile applications, digital displays, and other wireless technologies. Although data is not actively collected in all wayfinding infrastructure, information provided through the wayfinding technology and signage, such as travel times, would be provided by the TOC. Information could also be incorporated into a mobile application to be accessed on personal devices. Travel time information from Valley Metro could be provided via similar technology. The Town of Gilbert may consider wayfinding for destination areas around the Town such as the downtown area and the park/trail transportation system.
- *Parking information* may also be integrated into wayfinding systems. Parking information systems help provide information regarding parking availability and capacity, requirements, and the ability to pay for parking if the Town chooses to go that direction. Similar to other wayfinding information systems, parking systems both collect data and disburse information either via signage or through a mobile application.
- For active transportation components, *bicycle parking technology* may be utilized to show the nearest available secure bicycle parking and storage. This application is similar to the parking information provided above.
- *Transit-oriented active transportation technology* that would aid in connecting the Town's transportation system include the following (note, any transit-oriented technology deployments or improvements would need to be closely coordinated with Valley Metro):
    - Traveler information/displays: next arriving bus, time to next destination, etc. via a full-matrix DMS board at the transit station stop.
    - Wayfinding and traveler information systems: to be located at existing transit stations, the downtown area, park and ride locations, or other regionally focused areas (San Tan Village, Gilbert Regional Park, etc.) throughout the Town.
    - Bicycle-sharing stations: Check-in and check-out records and GPS systems allow for information to be gathered on length of trips, destinations, routes, and frequency of use.
    - Dockless micromobility: scooters and bicycles have GPS systems that allow for information extraction via third parties.
- *Separated bicycle signal heads* in places where separate facilities are constructed in the future (cycle tracks, paved path crossings, complex intersections, etc.).
    - Accommodates bicycle only movements within the signalized intersection.
    - Gives bicycles (or pedestrians) priority.
    - Requires additional infrastructure (heads, detection, actuation, etc.).
- *Mobile technology/applications* that have the ability to count and track user information, if allowed; data could be collected from smartphones, watches, wristbands, etc.

- *Pedestrian signal actuation buttons* can be used to estimate pedestrian demand in areas.
- *Wi-Fi and Bluetooth sensors to monitor crowds* in a small area, network, or public transit stations.

5.2 People

The Town has expanded in total population, the amount of publicly owned assets and infrastructure, in diversity of travel preferences, and in the tools and capabilities to provide traveler information. Town staff numbers have not seen a level of growth proportional to that of its infrastructure and population, and this has forced Town staff to take on a greater number of tasks and level of responsibility in order to provide a continued high level of service that has always been provided and has largely become expected.

While the Town continues to experience growth through 2020, the prevalence and acceptance of technology makes 2020 an opportune time to re-evaluate current job functions within the Town as they relate to TSMO and consider where realignment of roles or positions may produce efficiencies for the Town.

This section was developed to provide the Town with next steps toward achieving the following strategies:

- 11. Organize and clarify staffing roles and responsibilities to make sure there are staff identified and available to perform all TSMO functions
- 12. Implement a quantifiable staffing formula for TSMO staff to justify systematic hiring

Table 3 summarizes and provides additional implementation details for the People strategies.

Table 3: People Strategies Summary

Strategy	Description/Actions	Deliverable / Outcome	Considerations	Timeframe & Updates	Responsible Party
11. Organize and clarify staffing roles and responsibilities to make sure there are staff identified and available to perform all TSMO functions	Review the recommended and revised Public Works/Engineering roles as part of this strategy. Once confirmed, complete the following steps in line with a complete and rounded TSMO Program: • Revise position descriptions within HR and re-position staff as needed. • Create new positions both in the Public Works/Engineering group as well as other partner departments to serve specific TSMO functions. • Evaluate (at a later date) where Inspections take place in the Town's organizational structure.	Updated Public Works org chart New job titles and associated descriptions	• Utilize the TSMO Function Evaluation process prepared for this plan to help show functions not getting accomplished with current staffing arrangement to help justify additional or altered staffing needs. • Pursue liaisons between Public Works and IT in the form of 'embedded' staff, rather than as 'dedicated' staff. • Mesa and Peoria may have good experiences and lessons learned and examples of benefits of certain staff positions or organizational structures.	Near and Mid-term Revisit staffing structure of having Inspectors under Development Services at the time when the Town is built out and projects are focused on maintaining rather than new construction	Lead: Traffic, Public Works Support: Town Manager's Office, Digital Gvt, IT, Development Services
12. Implement a quantifiable staffing formula for TSMO staff to justify systematic hiring.	Work with Public Works management staff to vet and create a business case that justifies a 140 device-to-technician threshold, equating to 10 technicians in the near-term. This staffing ratio should be taken to council for approval and then be used to systematically hire additional technician staff as the Town continues to build out its technology and traffic network.	Policy supporting a staff-to-infrastructure ratio for TSMO positions	• The 140-to-1 staff ratio for technology and signal assets and the 100-to-1 staff ratio for fiber assets is based on best practices and federal guidance, such as through the FHWA Traffic Signal Operations and Maintenance Staffing Guidelines. • It is recommended that traffic signal and ITS device maintenance ultimately be performed by the same staff (in line with Strategy 11). • For current infrastructure levels (as of October 2020) the staffing formula would result in a recommended 10 technician staff to support technology and traffic signal maintenance. • All positions shown on the proposed organization chart are existing or underway with the exception of the Traffic Signal Specialist (ITS). This position (and any future positions) will require sustained funding from the Town's General Fund.	Near-term	Lead: Traffic/ TOC, Streets Support: Public Works, Town Manager's Office

Strategy 11: Organize and Clarify Staffing Roles and Responsibilities for TSMO Functions

Staffing within the Town's Public Works Department has evolved and adjusted over time. Current staffing positions and organizational structure were put in place prior to the addition and use of significant technology and prior to the discussion of a TSMO-focused workforce. As the focus on technology and real-time operations increases, it becomes necessary to evaluate the staffing structure in terms of positions (knowledge, skills, abilities) and reporting structure.

A detailed analysis of Town staffing was completed using the framework of desired TSMO functions. The analysis identified some potential changes to the Town's organizational structure that would help better serve TSMO functions.

Core TSMO Structure

The proposed staffing approach for TSMO in this document recognizes that TSMO is an important component for streamlining Town public service and also aims to maintain the long-standing customer service and project delivery approaches that have served the Town well over the years. The goal of the proposed staffing adjustments is to centralize TSMO staffing, reduce functional overlap between existing staff, develop positions with focused responsibilities and areas of expertise, and right size the TSMO structure.

The "people" focus of a TSMO approach requires a solid foundation of traffic engineering functioning in cooperation with other Town departments and real-time operations generated by the TOC. While the focus for TSMO is different than traditional traffic engineering, many of the skills are similar and can transfer. Staff typically cannot focus on both functional areas due to resource constraints, so there is often a division within groups between those dedicated to traffic engineering and those dedicated to real-time operations (considered TSMO). Typical position hierarchy within the two groups (traffic engineering and real-time operations) is shown in Table 4.

Table 4: Core TSMO Structure by Organizational Level

Level	Traffic Engineering	Real-Time Operations
Engineer/ Manager/Supervisory	• Traffic Engineer(s) – oversight of traffic engineering and project prioritization	• TOC Manager(s) – oversight of real-time operations and project prioritization
Technical Specialists	• Engineering Specialists(s) – evaluation of broader traffic engineering objectives	• Communications Specialist(s) – communications and network asset and uptime management
Operators/ Technicians	• Data Analyst(s) – data analysis and evaluation for improvements • Technician(s)– preventative and responsive maintenance of traffic control (signing, striping, signals)	• Data Analyst(s) – data analysis and evaluation for improvements • TOC Operator(s) – real-time operators and responsive to real-time data-driven decision-making • Technician(s) trained in ITS devices – preventative and responsive maintenance of assets used in real-time operations
Liaisons	• Liaison(s) to Other Departments – work with both groups to serve Town objectives	

The separation of responsibilities help clarify and focus the goals of each position and allow staff to coordinate appropriately and effectively with counterparts in other groups as well as with other agencies in the region.

Evaluation of Roles Involved in TSMO Approach Within the Town

The project team evaluated the existing roles of Town staff as they apply to the core structure described in Table 4. Five primary TSMO functions were considered recognizing the entire lifecycle of a TSMO strategy and the various people involved in each function: Planning, Design, Construction, Operations, and Maintenance.

The TSMO functional evaluation was focused on addressing the following:

- *Streamlining duplicative efforts* – This includes within the Public Works/Engineering group as well as overlaps with other departments in the Town.
- *Filling gaps in TSMO activities* – This captures where TSMO activities are not being performed, are being performed minimally, or are being performed by a staff position not officially assigned to the effort.
- *Separating Traffic Engineering from Real-Time Operations functions* –This aims to separate focus between the planning and design reviews versus real-time operations and maintenance.
- *Creating hierarchy and supervision* – Each function or task should have a specific person responsible for the completion of the task and a separate person providing oversight/supervision and held accountable.

A Responsible, Accountable, Consulted, and Informed (RACI) analysis approach was utilized to match TSMO functions to staffing roles in terms of level of responsibility. This RACI approach identifies all staff that are expected to be involved in each activity related to TSMO. Currently, some TSMO activities are occurring in the Town but not all departments are consulted or not all appropriate representatives are engaged to guarantee the best outcome. There are also important TSMO functions that are unaccounted for and need to be assigned. Reviewing the Town's ability to serve each TSMO function helps identify the proposed staffing needs both in terms of position types and position hierarchy. The RACI analysis results are shown by TSMO function in Appendix G and should be utilized to help develop a variety of internal activities such as defining or redefining position descriptions, supporting Town development of formal Standard Operating Procedures (SOPs) to capture the activities outlined under each TSMO function, and formalizing processes such as plan review processes, regular meetings between departments, and development of agreements.

Responsible ⇨ The person who is assigned to do the work.

Accountable ⇨ The person who has ultimate ownership for the completion of the task. This person delegates the work to those responsible for achieving the task.

Consulted ⇨ The person who must be consulted before a decision or action is taken. This person is typically a subject matter expert who has two-way communication with the person responsible.

Informed ⇨ The person who must be informed that a decision or action has been taken. This person is kept up-to-date on progress and completion of a task or deliverable.

Appendix G also provides a summary of TSMO positions with their assigned functions under the proposed staffing. The Responsible (R) categories of the RACI analysis shown in the previous table are brought

forward to determine workload by position. Recommended roles that are new to a position are shown in red, whether moved from an existing position or previously not performed . These "responsible" items generally represent scope to be initially performed by staff and then reviewed/overseen by upper management. In this evaluation, functions were adjusted between staff positions to create a primary focus without any position being overloaded or underutilized. The adjustments also allow upper level management to spend more time on managing the system, managing staff, and providing broader direction and accountability in accomplishing TSMO functions. This arrangement will also provide more teaching opportunities to transfer skills to newer or more technical staff. This staffing table also highlights where additional TSMO staffing positions are proposed (new positions are highlighted in red).

Town staff can utilize the tables in Appendix G to review/adjust/create job descriptions based not only on the role each position serves within TSMO but also on the supervisory role relative to other positions.

Proposed Organizational Changes to Support TSMO Approach

To support the new TSMO functions and RACI staffing assignments, the Town's organizational chart was reviewed to determine the recommended structure for staffing and supervision. The Public Works Department was the primary focus of this organizational chart review, though the interaction with other departments was also considered. The proposed changes were reviewed with Town leadership several times to minimize any hurdles relative to implementation including accommodations for existing staff. Figure 7 provides the proposed staff organization (within Public Works) to support a comprehensive TSMO program and is directly related to the information in Appendix G. Figure 8 shows proposed staff additions in other Town departments. Details of each change are provided below:

<u>Reorganization of Specialists</u>

Traffic Safety Specialist – *Move to report to the Assistant Town Traffic Engineer.* Provides analyses and input on traffic safety, other Traffic Engineering activities as assigned, and supports the Assistant Traffic Engineer.

Traffic Engineering Specialist – *Move to report to the Assistant Town Traffic Engineer.* Performs signing and striping project review, other Traffic Engineering activities as assigned, and supports the Assistant Traffic Engineer.

ITS Specialists – *Move to report to the new ITS Network Engineer.* Responsible for ITS/TSMO asset management, ITS inspections, and ITS project review. This position will coordinate directly, as needed, with the Public Works IT liaison in the Office of Information Technology.

Traffic Signal Specialists (Signals) – *Move to report to the new Signals Supervisor.* Performs preventative and responsive maintenance duties as related to traffic signals.

<u>Creation of New Positions</u>

Traffic Engineering Specialist – *Provide new position reporting the Assistant Town Traffic Engineer.* Performs project review for construction traffic impacts and standards compliance, accessibility review, and other Traffic Engineering activities as assigned.

Traffic Studies Engineer – *Provide new position reporting the Assistant Town Traffic Engineer.* Provides level of service analysis and project reviews related to operational performance.

Signals Supervisor – *Provide new position reporting to the Town Traffic Engineer.* Oversees and manages Traffic Signal Specialists in performing maintenance duties as related to traffic signals. Oversees and

manages ITS Technicians in performing maintenance duties as related to ITS and communications equipment. Responsible for traffic signal review, utility coordination, and utility and accessibility inspection.

Traffic Signal Specialist (ITS) – *Provide new position reporting to the Signals Supervisor.* Performs preventative and responsive maintenance duties as related to ITS and coordinates with ITS Specialists as needed on maintenance of communications equipment.

ITS Network Engineer – *Provide new position reporting to the ITS Engineer.* Performs network support for TOC, manages software and data licenses, and maintains ITS security/firewall. This position will coordinate directly with the Public Works IT liaison in the Office of Information Technology.

Public Works PIO – *Provide new position reporting to Digital Government Marketing Officer (within the Office of Digital Government).* Performs direct liaison services between Public Works and Digital Government as related to CIP project information, transportation information, real-time condition information, and supports turning transportation and real-time operations data into information for public consumption.

Public Works IT – *Provide new position reporting to Deputy Director of Infrastructure (within the Office of Information Technology)*. Performs direct liaison services between Public Works and Information Technology as related to network support for TOC operations, data collecting/sharing/archiving between Departments provided through TOC systems and supports project prioritization and scoping involvement from the transportation perspective as it relates to Town IT efforts.

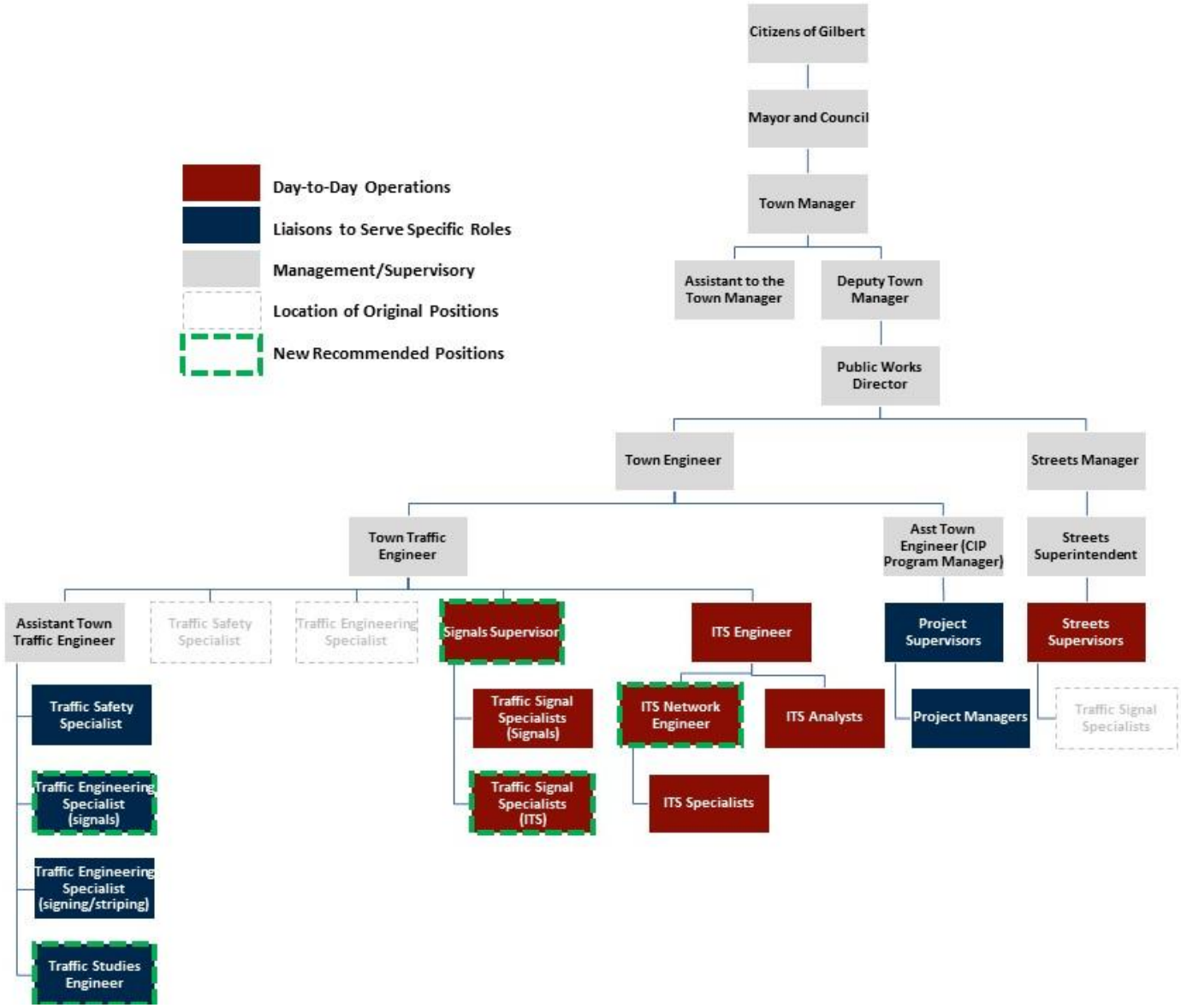

Figure 7: Proposed Staff Organization Involved in TSMO Activities (within Public Works)

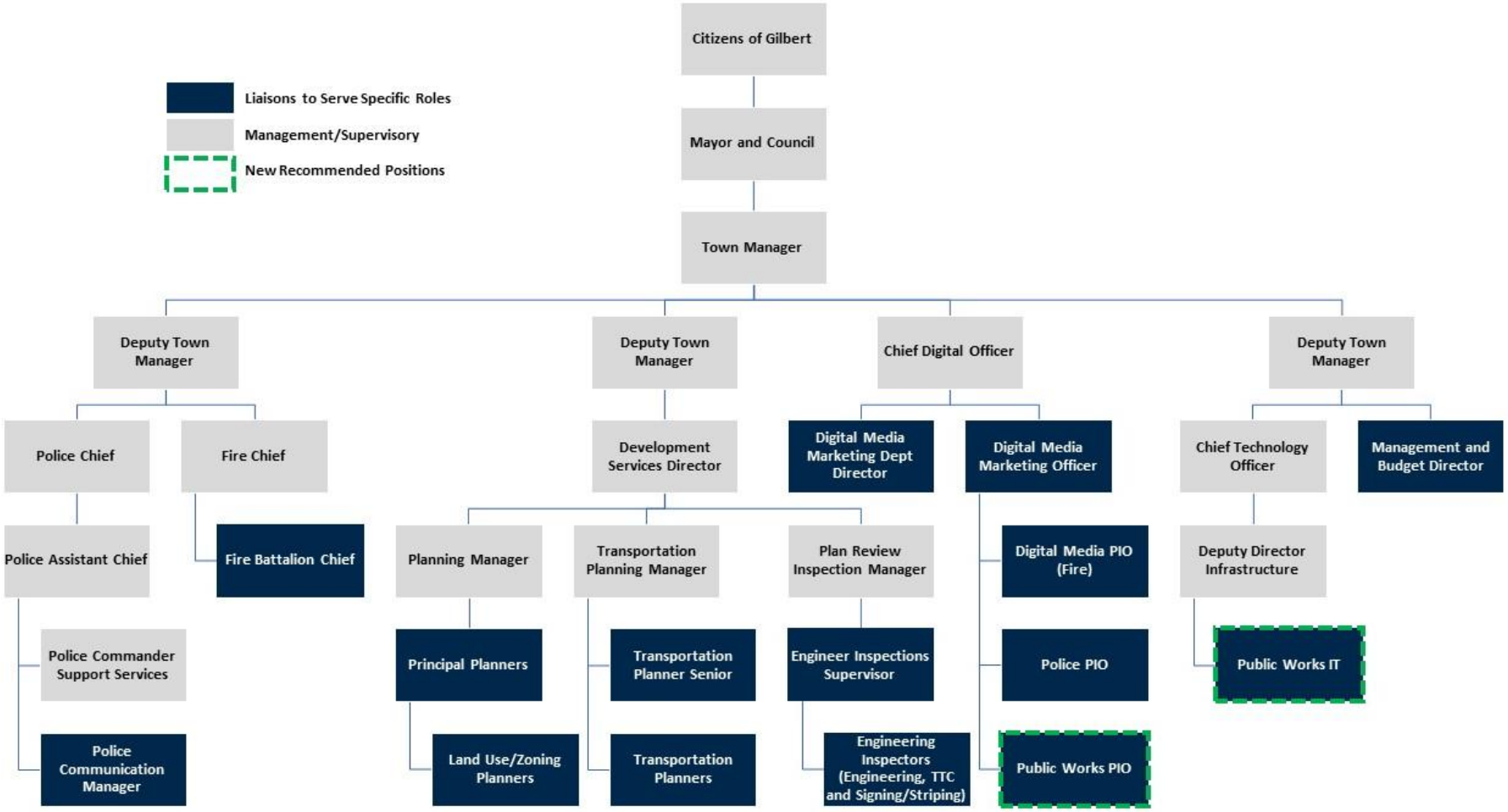

Figure 8: Proposed Staff Organization Involved in TSMO Activities (within Other Departments)

Future Considerations

As mentioned before, the Town has been in a rapid state of growth over the past decade. As the Town approaches "build out" and activities lean more toward redevelopment or replacement of existing assets, the Town should consider restructuring the project review and project inspections processes if the volume of new projects reduces. Specifically, the Town should review temporary traffic control, engineering, and signing/striping inspections processes, and staffing currently within the Development Services Division as they relate to the Engineering Division.

Strategy 12: Implement a Quantifiable Staffing Formula

Currently, Town traffic signals are maintained by Traffic Signal Specialists at a ratio of 30 traffic signals to one Traffic Signal Specialist. The Town Council has authorized the Streets Department to advertise and hire an additional signal technician whenever this ratio is exceeded in order to allow the Town to continue to provide the level of traffic signal maintenance and upkeep that has become expected. While the Town's ITS infrastructure is growing at the same pace as the traffic signal infrastructure, there has not been the same recognition for increasing staffing needs to support ITS device maintenance and operations. It is recommended that a similar staffing formula be established for ITS devices to allow for growth in technician staff proportional to the growth in field infrastructure.

Having a staffing formula is a proven method for proper justification of staff needed to serve any agency function. There is currently no TSMO, Engineering, or Traffic staffing formula that captures the entirety of the traffic signal and technology capabilities the Town has deployed for management and operation of the transportation network. To improve resource sharing, it is recommended that any quantifiable staffing formula, which in this case will be a ratio of staff to equipment, should serve both the signal and technology needs of the Town. This ratio would not need to be implemented until the Traffic Signal Specialists are moved under Traffic Engineering.

A recommended staffing ratio was developed utilizing national guidance and experience with other agency maintenance efforts. The Federal Highway Administration (FHWA) Traffic Signal Operations and Maintenance Staffing Guidelines, and corroborated by ITE and IMSA recommendations, suggests an average ratio of 140 ITS devices (which includes signals) per technician (ratio = 140:1) and 100 communications miles/devices per technician (ratio = 100:1).

To implement this ratio, it is recommended for the Town to cross-train current and future Traffic Signal Specialists to maintain technology assets as well as traffic signal infrastructure. The recommendation is to hire appropriately to match maintenance ratios per staff and then train all staff in the Traffic Signal Specialist role to properly perform preventative maintenance tasks (using Appendix H as guidance). Based on current Town infrastructure levels (as of November 2020), the recommended ratios would require 12 technicians – 2 for communications and 10 for signals and other equipment – as shown in Table 5. The Town currently has 1 communications technician (ITS Specialist) and 8 signals technicians (Traffic Signal Specialist). This calculation results in the recommendation that the Town currently have 2 ITS Specialists and 10 Traffic Signal Specialists to support technology and traffic signal maintenance.

Table 5: TSMO Maintenance Staffing Formula

Total Infrastructure	Quantity	Staff to Maintain
Fiber Miles (includes Associated Equipment of Fiber Optic Access Points, Splice Closures, Switches, and Ethernet Converters)	74.4	ITS Specialist Role
Wireless Radios	134	
Total Communications	208.4	Two (2) ITS Specialists
Recommended Ratio	100:1	
Traffic Signals	213	Traffic Signal Specialist Role (Signals and ITS)
Additional Signal Locations	28	
Video Detection Cameras	650	
Advanced Detection	72	
CCTVs	127	
Dynamic Message Signs	2	
ARIDs	82	
Emergency Vehicle Preemption	239	
Total Technology	1,413	Ten (10) Traffic Signal Specialists (Signals and ITS)
Recommended Ratio	140:1	

These ratios and the calculation process can be extrapolated in the future to evaluate staffing levels needed for the future.

Understanding there is an existing staffing shortage, adding additional technology that are desired by the Town will only exacerbate the staffing challenges. To address this challenge, it is recommended that a process be put in place during the capital project programming process for traffic signals or other technology or communications projects that requires consideration of the staff time needed to operate and maintain the new infrastructure in addition to the existing infrastructure.

5.3 Data

As part of the "What Works Cities" initiative, the Town is pursuing certification to align with the national standard of excellence for well-managed, data-driven local government. There are efforts underway to determine the appropriate criteria the Town should use to report on its level of management. Part of the "What Works Cities" effort is evaluating what additional metrics could be added to the monthly Town Manager's Report.

The Town should consider expanding its TSMO performance tracking and reporting beyond what is recommended through the "What Works Cities" initiative. The recommendations for data collection and reporting in this section will bolster the Town's ability to be transparent and well-guided in making funding and personnel investments, which will both support efforts to achieve certification from "What Works Cities" and show residents that the Town is making sound investment decisions.

The recommendations in this section provide three methods of data collection and dissemination:

- Regular reporting processes to help Town staff and Council track status of transportation actions and activities;
- Creation of an internal data dashboard primarily used by the TOC to support real-time operational decision-making; and
- Development of an external data dashboard primarily used by other Town staff as well as the public to support situational awareness, identify successes, and determine needs for future investments.

This section was developed to provide the Town with next steps toward achieving the following strategies:

- 14. Implement performance-based decision making
- 16. Develop an internal and external data dashboard

Table 6 summarizes and provides additional implementation details for the Data strategies.

Table 6: Data Strategies Summary

Strategy	Description/Actions	Deliverable/ Outcome	Considerations	Timeframe & Updates	Responsible Party
14. Implement performance-based decision making for transportation operations and investments	Implement an Automated Traffic Signal Performance Measure (ATSPM) program and associated Measurement, Accuracy, and Reliability Kit (MARK 1) dashboard. • Refer to ATSPM Installation Manual and reporting details for technology and data required for ATSPM and MARK 1 applications. • Engage IT in discussions related to equipment (servers, cloud hosting) and software for this task • Install/ download open source codes for both applications. <u>For Operational Decision Making:</u> • Work with IT department or hire a contractor to configure ATSPM and MARK 1 applications at the TOC. • Identify training for ATSMP that TOC and other interested staff could take to understanding how to use and understand ATSPMs. • Decide thresholds for metrics in the system that warrant a response (ex: looking at a camera; conducting a study; changing a timing plan), and update operator SOPs with appropriate thresholds and responses. <u>For Investment Decision Making</u>: Utilize the MARK 1 dashboard that generates monthly or quarterly performance based on ATSPM data, including corridors, device, and staff. • Utilize corridor performance metrics to identify where investments, such as new/upgraded devices or studies, are needed to support improved corridor operations. Corridor performance metrics can also support before-after studies to help show impacts and return-on-investment for traffic management strategies, devices. and systems.	ASTPM and MARK 1 platform installation at TOC Staff training Updates to TOC and incident management SOPs Periodic (monthly, quarterly) traffic network performance reports Updated budgeting processes for Traffic Engineering to utilize performance metric input	• There are detection requirements for ATSPM which must be in place for ATSPM to be effective (see Strategy 3). • The two software applications should be included in the infrastructure standards and requirements of Strategy 4 and the database of systems described in Strategy 15. • The Town may want to consider contracting with a consultant to provide ongoing maintenance or support for systems and resulting data outputs. • Operational decision-making outputs may warrant updates to various SOPs that are developed for traffic operations and incident management processes (Strategies 6 and 10). • The Watchdog application through MARK 1 will provide alerts when there are abnormalities in operational conditions or equipment, which may help indicate something is wrong.	Near-term System should be upgraded to include any new traffic signals or upgraded detection as they are installed May want to undertake periodic updates to the open source platforms as new versions become available	Lead: Traffic /TOC Support: IT

Strategy	Description/Actions	Deliverable/ Outcome	Considerations	Timeframe & Updates	Responsible Party
	• Utilize equipment performance metrics to identify where investments are needed to improve reliability or functionality of existing equipment or communications. • Document key findings from regular reports that are generated and refer to these during annual budgeting processes to support staffing, equipment, and consulting services requests.				
16. Develop an internal and external data dashboard	<u>Internal (Traffic/TOC) Dashboard</u> • See Strategy 14. <u>External (All Town Departments/Public) Dashboard</u> • Establish connections between the IT data repository (see Strategy 15) and the following sources/data: o Traffic/TOC MARK 1 platform for historical traffic condition information o Town One Stop Shop for construction/ roadwork data o Police Computer Aided Dispatch (CAD) system for crash location information (only pulling limited information fields for traffic-related incidents, as to avoid data privacy concerns) o TOC traffic management system for real-time camera feeds or snapshots • Create a Transportation-specific tab on the Alex system that links to a customizable user interface for a variety of transportation information, as identified by Town staff. • Link the IT database with the Alex system to feed relevant information into the Alex interface. • Create interfaces to external data sources based on the desired interface, which might include Google maps, Valley Metro transit, Twitter, or local weather.	Transportation Page on Alex website with real-time traffic data map	• This strategy should build upon and expand the data developed from Strategy 14 and 15. • Having access to real-time construction restriction information is a high priority for many Town departments and the public. Connecting to the Town's One Stop Shop application will help with providing this link, but there will need to be additional processes put into place in order to provide real-time restrictions, as opposed to the permitted information. The Town should consider putting responsibility on contractors for entering information into One Stop Shop in real-time through the permit information form, including when they initiate any roadwork restrictions and when the restrictions are lifted.	Mid-term Strategies need to be completed prior to this strategy being pursued	Lead: Digital Government Support: IT, Traffic/TOC, Streets, Police

Strategy 14: Implement Performance-Based Decision Making

The Town currently provides limited reporting on transportation performance. There are no real-time data-driven processes for decision-making within the Town's transportation system outside of public survey. A recent public survey indicated that congestion was a major issue in the Town and reporting on congestion metrics could help foster accountability and show progress in easing congestion moving forward. Table 7 provides some potential congestion performance metrics using Town-owned assets that could provide transparency for the Town's transportation system. Third-party data can be used as well to supplement Town-owned asset data collection activities. For each metric, considerations such as the applicable data and the types of calculations that could be conducted are included.

Table 7: Recommended Congestion Performance Metrics

Target	Measurement	Source/Collection Method	Calculations
Decrease vehicle delay	Percent reduction in vehicle delay duration by intersection and direction while balancing the potential negative impact on travel times	• Vehicle occupancy and speed	• Vehicle occupancy (via detection/camera) = timestamp of beginning of detector occupancy - timestamp of end of detector occupancy • Percent reduction for occupancy = [(detector occupancy for time 2)-(detector occupancy for time 1)]/ (detector occupancy for time 1) • Vehicle speed (via detection/camera) = speed of vehicles as detected by detector • Percent reduction for speed=(vehicle speed detected at time 2)-(vehicle speed detected at time 1)/ (vehicle speed detected at time 1)
Increase signal timing changes to accommodate for congestion changes	Percent of signal timing changes made as a result of recurring or non-recurring congestion	Central management system controlled by TOC: • Signal change timestamp • Reason for signal timing change Incident reports: • Incident response or congestion initiating of activity	• [(Total number of signal timing changes made)-(number of changes where reason for recording is congestion, an incident, or a planned event including work zones)]/(total number of signal timing changes made for any reason)
Reduce congestion resulting from incidents	% congestion reduction during incidents	Mainline arterial and advanced detection devices: • Volume on corridor before and after incident • Volume on adjacent arterials before and after incident • Queue length (CCTV or detection) on corridor • Incident duration	• Percent of volume increase due to incident= [(Volume on corridor 10 minutes after incident start time)-(volume on corridor before time of incident)]/(volume on corridor before time of incident) • Percent of volume on adjacent arterials due to detouring traffic away from incident= [(Volume on adjacent arterials summed together 10 minutes after incident start time)-(volume on adjacent arterials summed together before time of incident)]/(volume on adjacent arterials summed together before time of incident)

A full suite of recommended transportation performance metrics that can be reasonably calculated and reported are provided in Appendix H for the Town's consideration. Metric categories include safety, mobility, preservation, environmental, and stewardship. For each metric, a proposed target, measurement, data source/collection method, and calculations (if applicable) are provided. The magnitude of performance reporting by the Town will need to be determined following the completion

of this TSMO Plan; however the Town should look to move beyond high-level metrics and instead utilize the full capabilities of the data collected.

Some possible outlets for reporting performance metrics could be:

- *Gilbert Benchmark Report* – As part of the Town's performance management strategy, Gilbert reports a bi-annual Gilbert Benchmark Report. This evaluates the Town's progress in achieving "best in class" status as an organization by identifying 81 measures that span 27 departments and divisions, utilizing 40 benchmark communities. Notably, traffic and real-time operations are not included in the Town's current reporting each cycle. There are also currently no transportation items reported in the Town Manager's Report.
- *Valley Benchmarking Cities Report* – The Town of Gilbert is also part of a Phoenix metropolitan area consortium known as the Valley Benchmarking Cities, comprised of the 11 largest cities in the area, Arizona State University, the Alliance for Innovation, and the International City/County Management Association. A report is provided every year titled the "Valley Benchmarking Cities Report" and provides information to city leadership and the public on 24 Valley-wide measures. This report does not include traffic or real-time operations performance metrics, but the Town could include metrics for traffic and real-time operations that could support Valley-wide metrics reporting if they are included in the future.

Strategy 16: Develop an Internal and External Data Dashboard

Internal Data Dashboard

A centralized location of performance data can be invaluable to operating a successful transportation network. An internal dashboard specific to traffic would enable data-driven decision making and help identify where traffic operations adjustments, such as signal timing or maintenance activities, needs to be targeted. In order to provide a complete view of the transportation network within the Town of Gilbert for the traffic operations staff, an internal dashboard is needed that pulls from multiple systems.

Existing systems include the Town's Advanced Traffic Management System (ATMS) that is used to operate all traffic signals and equipment from the TOC, the Town's traffic restriction log for construction, and the Luxriot video management system that is used to view and share CCTV camera images. Two new platforms are recommended to provide Automated Traffic Signal Performance Measurement (ATSPM) and real-time traffic signal metric monitoring and reporting (MARK-1). For each of these systems, the following attributes are recommended to help translate data into information and real-time operational decision making:

- Advanced Traffic Management System (ATMS)
  - Signal Log with Map
  - Real-time Traffic Map
- Automated Traffic Signal Performance Measurement (ATSPM)
  - Signal Log with Map
  - Action Taken Log
  - Signal Analysis
  - Traffic Restriction Log
  - Resource Links
    - Tutorial
    - Manuals

        - Go-Bys
- Measurement, Accuracy, and Reliability Kit (MARK-1)
    - Performance Measurements and Trends (monthly and quarterly basis)
        - Performance -Based
        - Volume-Based
        - Equipment
        - Activity
    - Corridor Analysis
    - Statistics
    - Alert Tracker
    - Resident Survey Results
    - Resource Links
        - Tutorial
        - Manuals
        - Go-Bys
        - External Dashboard (Alex)
- Construction
    - Traffic Restriction Log
- Cameras
    - Luxriot

An in-depth list of internal data dashboard recommendations is provided in Appendix I, including recommended sources of data. The following sections will provide an overview of the recommended data dashboards for Traffic Engineering operations and management.

ATMS Recommendation

An Advanced Traffic Management System (ATMS) is currently being utilized by the Town of Gilbert's TOC to monitor and manage traffic operations. Because an ATMS is already being utilized, the Town is gathering data 24/7/365 which could be used to further improve the traffic system operations. Therefore, it is recommended that the Town continue to use its ATMS and have it feed into a data analyzer that will permit for the performance measurement of existing and future equipment.

ATSPM Overview and Recommendation

An ATSPM program would allow the Town to automate traffic signal performance data and keep staff up-to-date on operational needs within the network. The benefit of ATSPM is that it allows staff to utilize continuous data that reflects real-time performance rather than rely on brief observations or public perception. There are free source codes for ATSPM, that provide many analytical tools and a dashboard for optimal transportation system management, available on github.com.

Because the ATSPM source code is available online for download, the Town is able to obtain and customize the source code through Town IT staff or contractor support. The steps involved include downloading and installing the software, software configuration, and connecting all signals and detectors to the system. Currently, each device must be configured separately, but other local agencies in the MAG region are working on configuring a system that would automate/streamline this process, which the Town can leverage once completed.

A complete ATSPM database overview is available here:
https://traffic.dot.ga.gov/ATSPM/Images/ATSPM_Component_Details.pdf

Best Practices in ATSPM Implementation

- Set up at least 3 servers to prevent overwhelming a single server.
  - Webserver
  - Database Server
  - Processing Server
- Update database as new equipment is installed.
- Update software and hardware as it becomes available.

Challenges with ATSPM Implementation

- Educating staff on new program and implementing it into daily practice.
- Maintaining the system database, keeping it up to date.
- May need an ongoing consultation/on-call agreement to maintain software/hardware and database library.
- Ongoing host fees can range.

It is recommended that the Town utilize the ATSPM open source code and, if desired, have a contractor configure for optimized signal operations, as well as compile all existing data into the system. The Town is undertaking an evaluation process under project TS1740 that will help determine the appropriate use of ATSPM tools and resources.

The Utah Department of Transportation developed this system to perform a complete analysis of single signals that can be used as a guide. The metrics available include:

- Purdue Phase Termination
- Split Monitor
- Pedestrian Delay
- Preemption Details
- Turning Movement Counts
- Purdue Coordination Diagram
- Approach Volume
- Approach Delay
- Arrivals on Red
- Approach Speed
- Yellow and Red Actuations
- Purdue Split Failure
- Left Turn Gap Analysis

Some other tools that the open source website offers are the Signal Configuration subtab, which possess all signal information including: Signal identification, controller type, primary and secondary name, geographic location, approach phases, and detection information and capabilities. The Log Action Taken feature allows for technicians, workers, and travelers to log issues observed while in the field. The simple form includes name, date, signal, agency, actions, metric types, and any additional comments (as shown in Figure 9).

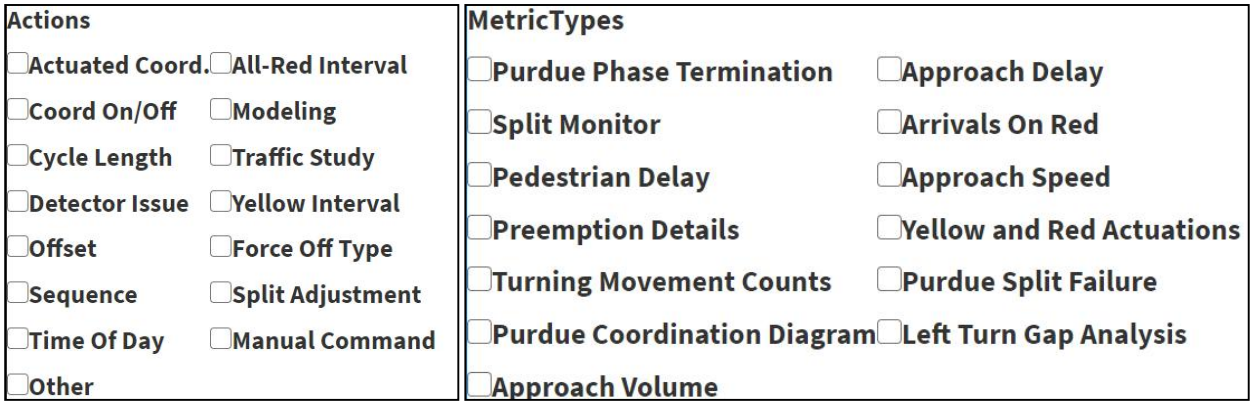

Figure 9: Actions and Metrics Options for Log Action Form

Within the dashboard there are various links to provide guidance in understanding what equipment is needed for collecting data, how the data is displayed, and what the data means.

- ATSPM Component Details
- ATSPM Installation Manual
- ATSPM Reporting Details

ATSPM may introduce various infrastructure/technology requirements to create optimal data collection capabilities. As the system communicates directly through the traffic signal controllers, the signal controller must be supplied by vendors that support ATSPM: Econolite ASC/3, Siemens, TrafficWare, Peek, and Intelight MaxTime. In some cases, metrics are dependent on specific detection requirements, which are provided in Table 8. Not all intersections need to be equipped with the detection outlined in the table to be included within ATSPM, but those intersections without it will not be able to calculate certain metrics.

Table 8: ATSPM Metric Detection Requirements

Metric	Detection Needed
Purdue Coordination Diagram	Setback Count (350ft-400ft)
Approach Volume	Setback Count (350ft-400ft)
Approach Speed	Setback Count (350ft-400ft) using radar
Purdue Phase Termination	No detection needed or used
Split Monitor	No detection needed or used
Turning Movement Counts	Stop bar (lane-by-lane) count
Approach Delay	Setback Count (350ft-400ft)
Arrivals on Red	Setback Count (350ft-400ft)
Travel Time	Historical INRIX or HERE Data

MARK-1 Overview and Recommendation

MARK-1 gathers the data from ATSPM and displays it to show arterial, volume, equipment, and activity performance in real-time and as quantitative monthly and quarterly summary reports. The MARK-1 application will support analyses at the corridor, zone, or route level, rather than at the traffic signal or intersection level. This is extremely important when developing data-driven decision making in real-time, as it allows for a higher-level look at the entire system.

There are several subtabs that are offered in the MARK-1 source code: One-month summary, quarter summary, summary trend, performance, volumes, equipment, reporting, watchdog, signals list, and signal details. These analytics can be broken down into signal groups; if a signal group is selected, the data can be broken down further into corridors, intersections, and sub-corridors.

In 2018, Georgia Department of Transportation, launched the Measurement, Accuracy, and Reliability Kit (MARK-1). This automated the previous reporting process which has resulted in approximately $250,000 in annual savings. The public website allows for engineers to track trends on an intersection, corridor, and programmatic level as well as visualize maintenance related problems. MARK-1 is an extension of their ATSPM that was modeled after the Utah Department of Transportation's system. The ATSPM website provides a single point of access to signal measures, reports, relevant links, and log actions taken for engineers, technicians, and other staff.

A unique feature, "Watchdog," displays various alerts for each intersection. Examples of alerts are no camera image, bad vehicle detection, bad pedestrian push buttons, pedestrian activations, force offs, max outs, counts, and missing records. Alerts can be displayed in a color format showing urgency or a tabular format that is available for exporting. Information on all metrics is provided in the 'about' subtab. An example of a data dashboard is presented in Figures 10 and Figure 11.

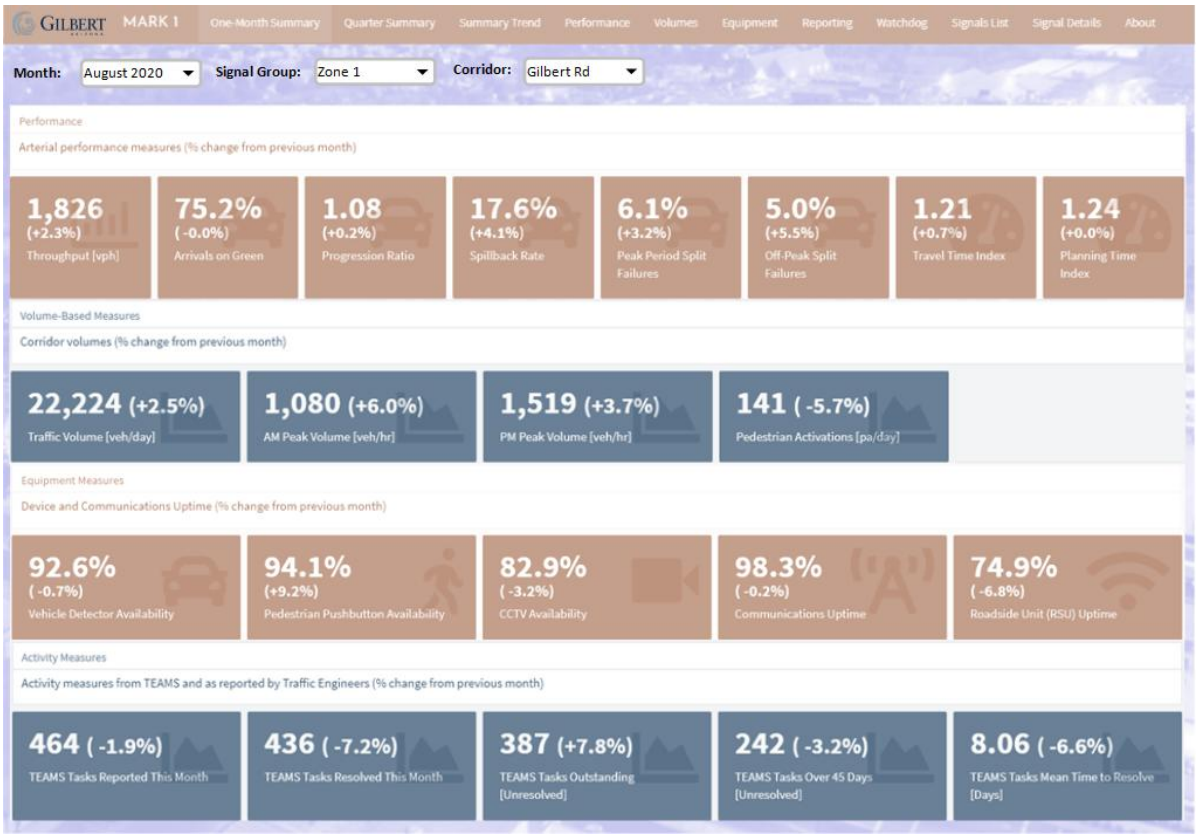

Figure 10: Internal Dashboard Example: One-Month Summary Reporting

Figure 11: Internal Dashboard Example: Real-Time Reporting Analytics

Though the MARK-1 source code is available online, agencies often hire an outside contractor to support installation and setup. MARK-1 is an extension of the ATSPM system and requires an ATSPM system and its resulting to be configured and active. For the Town to get an optimal dashboard, it is recommended that they hire IT specialists and engineers to configure the ATSPM and a corridor analysis tool using MARK-1 source code.

Construction Recommendation

To gather and make available real-time construction data, the Town should consider updating the construction permit information form located in Gilbert's One Stop Shop to include a construction start and end date that can be used to populate the ATMS database and Alex GIS map (see External Data Dashboard recommendation). The ultimate goal is to have this form available online for on-site workers to quickly complete when they start work and when they finish. This will allow for the construction location to auto populate into the real-time traffic information map that is available to the public and Town staff.

Camera Recommendation

The Town uses Luxriot Video Management Software to view and manage all CCTV cameras which has the functionality to continue to serve the Town's needs. It is recommended that the Town continue to use Luxriot for CCTV management and consider providing links within the Geographic Information System (GIS) database within Alex (which is described in more detail in the External Data Dashboard section below). Camera feed access should be "view only" with no camera control but allows all users (Town staff and the public) to have real-time camera viewing. Video refresh rates can be reduced to alleviate bandwidth and privacy concerns. An additional option for use internally by the TOC would be to link to the ATMS database for a centralized look of signals including live camera feeds.

External Data Dashboard

The external data dashboard is envisioned to provide the real-time transportation operations data needs of non-traffic Town staff and the public. The need for real-time traffic condition information, such as incidents, construction restrictions, and real-time camera images, has been consistently reiterated throughout the development of this TSMO Plan, and providing access to multiple kinds of real-time transportation information can improve safety, efficiency, transparency, and public perceptions about the Town's transportation network. Some uses cases may include:

- Police and Fire vehicles can identify the most efficient routing to public safety or emergency scenes and avoid any construction restrictions.
- A traveler can make informed pre-trip decisions on the timing and mode-choice for their trip both within the Town and within the larger region;
- The Economic Development department can utilize historical traffic volumes or transportation investment information to help recruit new developers and businesses to the Town; or
- A Town resident can see the various projects that the Town is undertaking to improve the transportation network and can see the operational impacts of these investments.

In order to provide a complete view of the transportation network within the Town of Gilbert, the following interface attributes are recommended as part of an external data dashboard:

- Customizable user interface to allow for optimized personal use (widgets)
- Layered map with camera locations, real-time traffic, and construction (potential for suggested detour routes)
- Planned event information (construction, special events)
- Unplanned event notification updates (twitter, 311, etc.)
- Local weather
- Links to additional resources
    - Tutorial
    - Transit information (real-time after VM creates application)
    - AZ 511
    - Gilbert 311
    - CIP Map
    - Area Maps
    - Quarterly Reports
    - Annual Reports
- Application is available on PC and mobile devices

The Town may look to model their interface after the SMARTTRAFFIC information website for Sarasota-Manatee Regional Traffic Management Center (TMC), which provides many of the functionalities that align with the Town's and residents' vision for an external data dashboard.

Currently, the Gilbert uses a data portal called Alex to display information and data that the Town collects, ranging from police call frequency to COVID-19 cases. A transportation-specific interface should be added within Alex and the Town's GIS platform to support the external data dashboard. Linking the information between the external and internal dashboards will help streamline efforts and maintain consistency between what is seen by staff and the public.

As discussed for the internal dashboard, the MARK-1 platform will automatically generate monthly and quarterly reports for transportation operations metrics and the conditions of transportation infrastructure and systems. Within the reports will be graphs and charts that can be easily used to create public friendly reports on a monthly and quarterly basis such as ITS and network summaries, number of notifications/alerts received, incidents detected, tasks performed, timing changes made, technology advancements implemented, traveler information updates, and a summary of project descriptions and goals.

An in-depth list of external interface options is provided in Appendix J along with examples of quarterly and annual summaries. The content recommended to be displayed on the external data dashboard and the sources of the data are shown in Table 9. Examples of what the external dashboard interface could look like through the Alex system are shown in Figure 12 and Figure 13.

Table 9: External Dashboard Content Recommendations

Attribute	Contents	Source	Details
Customizable Dashboard with moveable/expandable sub windows	Real-time traffic map	Google or Waze	Map Layer
	Real-time camera map	ATMS	Map Layer
	Planned event tracker	One Stop Shop, twitter	Widget
	Local weather	Weather.com	Widget
	Twitter/social media updates	Twitter, Facebook	Widget
	Real-time incident map	ATMS, Police CAD	Map Layer
	Real-time construction map	One Stop Shop	Map Layer
	Public submission form	ATMS	Widget

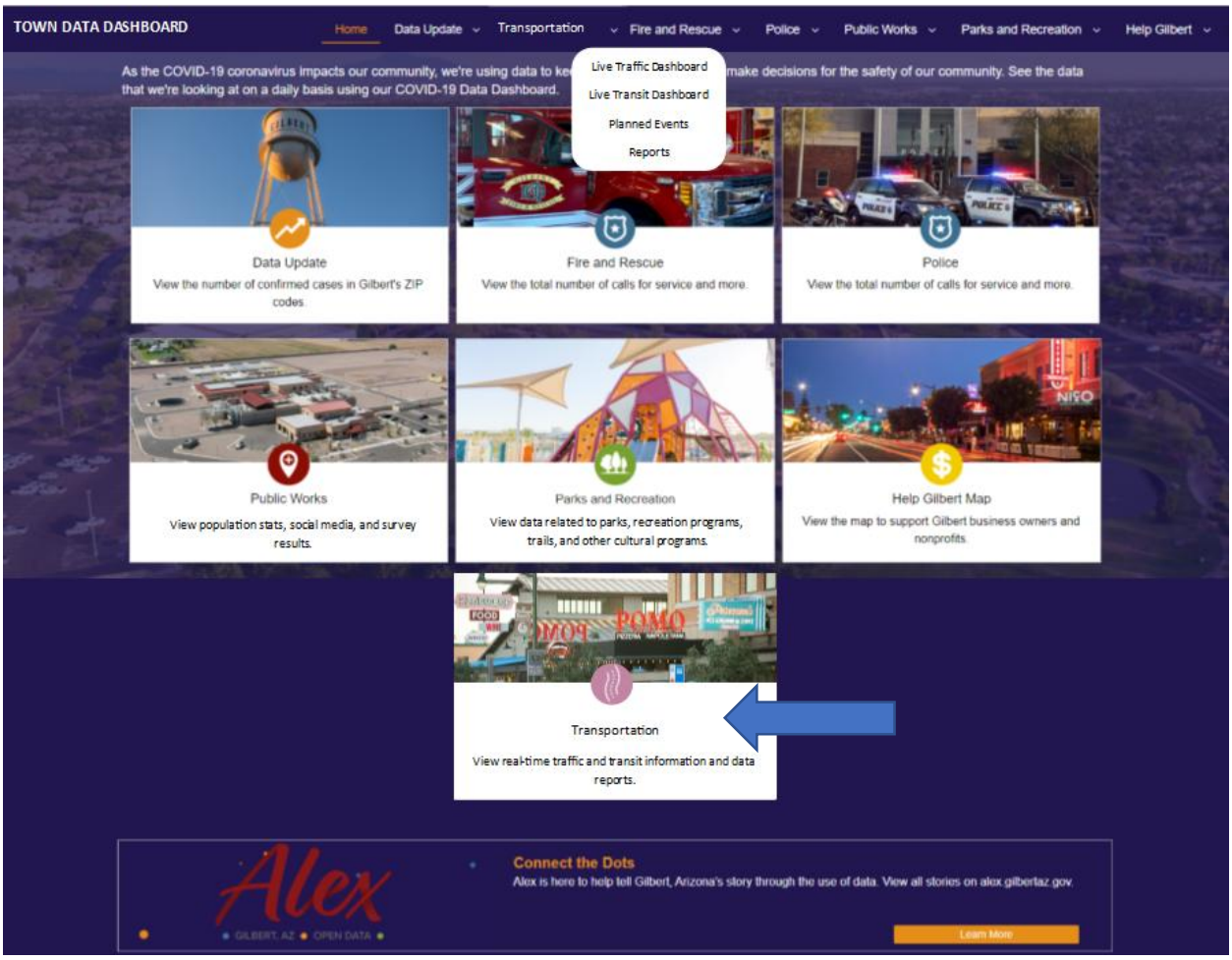

Figure 12: Example External Dashboard Homepage

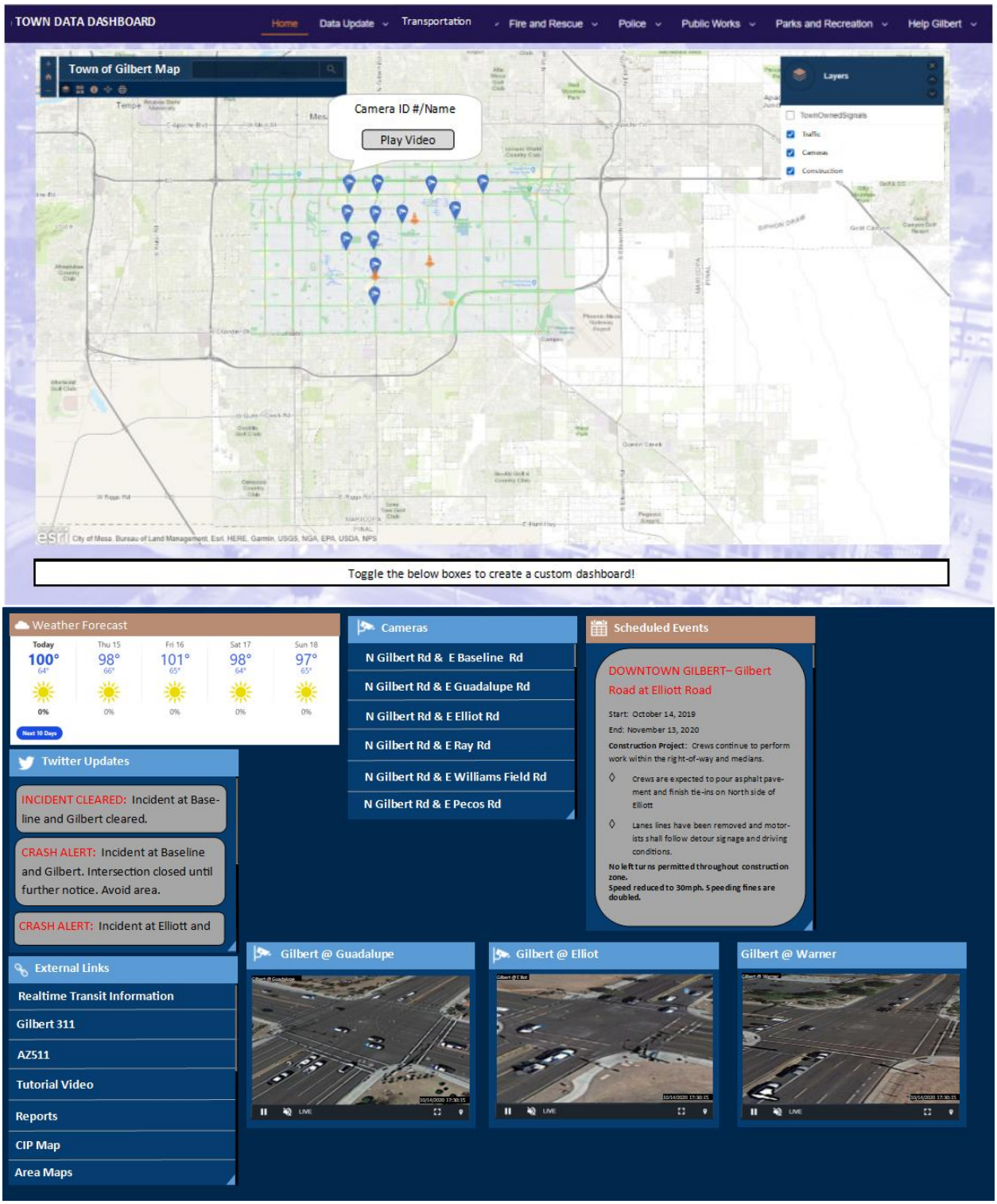

Figure 13: Example External Dashboard Interface

6. Implementation Resources

This document was developed to provide near-term actions that the Town could take toward achieving the broader vision and mission of the Town's TSMO Program. This section provides resources and tools to support the implementation of these strategies.

6.1 Collaboration for TSMO Success

It will be vital to the success of this TSMO plan for Town staff to continue to coordinate within and between departments and stay appraised of regional initiatives. A summary calendar of meetings and activities that are related to TSMO, of which a variety of Town staff should consider being involved in is provided in Appendix K. Within the calendar are key dates related to activities such as the Town's CIP process, MAG TIP programming, and other MAG funding mechanisms. For example, Town staff should consider actively participating in regional collaboration activities and meetings such as the MAG ITS Committee, MAG Active Transportation Committee, MAG Transportation Safety Committee, the AZTech Partnership, and others. It is important to be involved with these activities to stay appraised of regional initiatives or funding opportunities, build relationships and share information with other local and regional agency staff, and gain knowledge and skills related to the use and maintenance of technology.

Internal and interdepartmental meetings have been included within the calendar to support coordination and consistency. The meetings involve various levels of Town staff to ensure all departmental interests and concerns are considered when attending to Town tasks and planning for future projects. It is of value to extend invitations to other pertinent staff/departments when applicable to capture a full visual of the issues/tasks at hand. Table 10 summarizes internal and interdepartmental meetings and their frequencies (included in involvement calendar). Some of the suggested meetings currently take place and others are new. Not all meetings require a TSMO topic to be discussed nor attendance from a TSMO representative, but personnel involved in TSMO functions should be aware of these meetings occurring.

Table 10: Internal Meetings Summary

Meeting Name	Frequency	Current	Proposed
TOC Staff Meeting	Weekly	X	
Traffic Staff Meeting	Weekly	X	
Planning Meeting	Weekly	X	
Town Council Meeting	Two times per month	X	
Second in Command Meeting	Monthly	X	
Executive Team Meeting	Every other month	X	
TOC Meeting with Traffic Signal Technicians	Monthly	X	
Supervisors Meeting	Monthly	X	
Public Works Meeting	Monthly	X	
CIP Meeting with TOC/Traffic	Monthly		X
Fire/PD/Traffic Meeting	Quarterly		X
Development Services/ Traffic Meeting	Quarterly		X
Traffic/TOC Meeting with IT	Quarterly		X

This calendar should be made available to all Town staff for optimal coordination in making sure there is attendance at most of these activities. Town staff should keep meetings on a regular schedule to ensure all departments are able to attend and also to promote accountability. The Town should review the calendar annually and add or remove items as necessary to keep it up to date with all internal meetings and activities as well as necessary federal and regional involvement.

6.2 Cost/Benefit of Implementing TSMO Strategies

Being able to show cost/benefit ratios has become increasingly important when trying to apply for funding, as planning organizations around the country are being asked to justify their programs and expenditures. This can put TSMO projects at a disadvantage since it can be hard to analyze specific performance measures associated with operational improvements. Various initiatives have taken place at the regional, state, and national levels to develop analysis tools, methodologies, and information to support benefit-cost analyses (BCAs). As the Town works towards implementing TSMO strategies and maturing its TSMO program, there should be a concerted effort to set baseline data, collect new data, and perform studies that can highlight the tangible benefits of TSMO strategies, both from the perspectives of benefits to the Town and benefits to the residents and visitors of Gilbert.

The Federal Highway Administration (FHWA) has available helpful tools like the "Operations Benefit/Cost Analysis Desk Reference" and the "Tool for Operations Benefit Cost Analysis (TOPS-BC)," for application to TSMO projects.

As an example, BCAs that were conducted on outputs of the Southwestern Pennsylvania Commission TSMO Plan have been able to express benefits of implemented TSMO strategies. Cost/benefit measurements from this case study are shown in Figure 14.

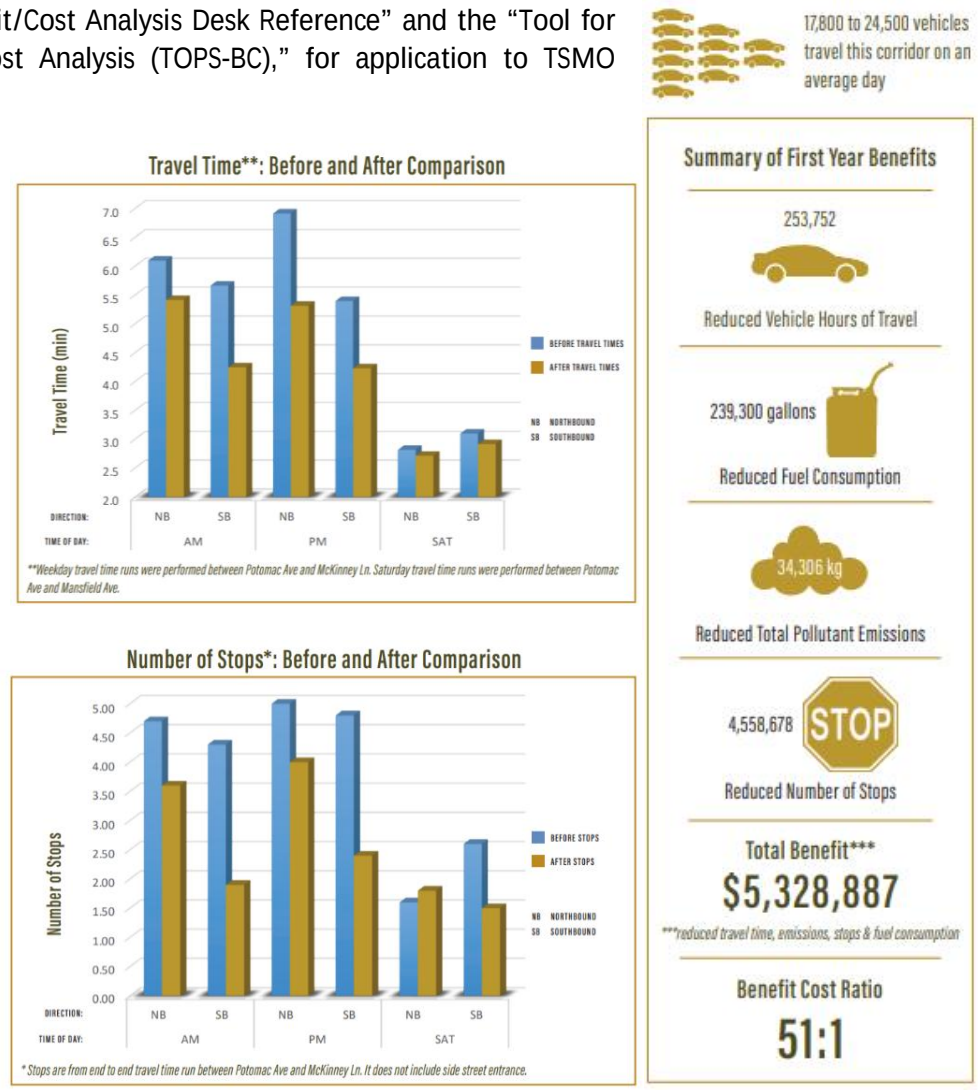

Figure 14: Benefit/Cost Case Study

As shown, a Regional Traffic Signal Program resulted in a $51 public return on investment for every $1 spent through the program. The benefits were realized through reduced delay, reduced vehicular stops, reduced fuel consumption, and reduced emissions. In the first year, the traffic signal program along one corridor was calculated to generate benefit of more than $5 million.

6.3 Funding

The strategies outlined in the TSMO Plan will be able to utilize a variety of funding sources that are targeted based on strategy owner and ultimate user. Local funding sources are utilized for a variety of purposes including new capital infrastructure, replacements, contracts, staffing, and other resources necessary to manage and operate the Town. Federal funding sources historically had only allowed for capital investments and did not allow for operations and maintenance costs. In a memorandum issued in September of 2019 by FHWA, federal funding was cited as being allowed to fund non-construction projects considered "operational improvements". This may have implications on which projects the Town can apply for through the MAG TIP process. Additional funding will need to be identified to support the recommended infrastructure, maintenance, and operations at its intended level.

Table 11 summarizes strategies that will require funding investments that should be included in the Town's CIP.

Table 11: TSMO Strategies That Require Funding

No.	Strategy	Cost
1	Implement an asset replacement and upgrade program for ITS and communications	• $181,000 (existing) to $212,000 (future) (annual cost)
2	Implement a preventative maintenance program for ITS devices and communications	• $540,000 (annual cost)
3	Fill ITS and communications infrastructure gaps	• $389,800 (one-time cost for Primary ITS Capital Project) • $300,000 (one-time cost for Recommended Active Transportation Trail Data Collection Project)
7	Implement Town traffic engineering and transportation operations standards	• An annual Traffic Signal Optimization Program (TSOP) or other recurring operational functions may require dedicated staff/funding. Regional funds are available to supplement and augment Town resources.
11	Organize and clarify staffing roles and responsibilities to make sure there are staff identified and available to perform all TSMO functions	• Costs to be assigned by Town based on pay grades associated with recommended new positions in Section 4.1
12	Implement a quantifiable staffing formula for TSMO staff to justify systematic hiring	• All positions shown on the proposed organization chart are existing or underway with the exception of the Traffic Signal Specialist (ITS). This position (and any future positions) will require sustained funding from the Town's General Fund.
13	Implement a formal training and cross-training program for TSMO staff and other staff who interact with TSMO	• Some external training programs may have a cost
14	Implement performance-based decision making for transportation operations and investments	• Staff time or consultant services to configure platforms ($50,000) and ongoing support services if desired • Cost of new servers if required • Ongoing hosting fee for cloud hosting (~$80 per month)
16	Develop an internal and external data dashboard	• See Strategy 14 for relevant costs

Table 12 reviews some of the relevant funding sources that may be leveraged to support the expansion in technology and operations of the Town transportation network in the future, including:

Table 12: TSMO Funding Opportunities

Town Funding	Town CIP The allocation of CIP funds are decided during an annual budgeting process that identifies funding for budgets, programs, and projects for the next year. The Town will need to leverage the CIP funds to cover operations and maintenance costs in addition to some capital projects and consultant services. Joint Departmental Funding This TSMO plan recommends upgrades that may not exclusively pertain to the traffic department but also have a direct positive impact on another Town departments (fire, police, etc.). The benefit of a TSMO approach is that these other funding sources can be leveraged to provide multiple benefits to various end users.
Regional Funding	MAG Regional Transportation Funds and Transportation Improvement Program (TIP) The MAG regional transportation programming, planning, and modeling processes have been designed to respond to federal and state mandates directed at the metropolitan transportation planning processes. MAG follows the guidance of Fixing America's Surface Transportation Act (FAST Act) when preparing programs and funding. Data, emergency services/incident management, and traffic management are common project attributes used to apply for MAG TIP funds. The TIP application process can vary (including timelines) and agencies should periodically check with MAG to determine the application deadlines for the next TIP update cycle. Intelligent Transportation Systems (ITS) MAG offers funding specific to ITS and TSMO historically in the amount around $6 million to $7 million. There are federal requirements to apply: 1. Demonstrate compliance with the MAG Regional ITS Architecture, and 2. Demonstrate compliance with the ADOT Systems Engineering Process (checklist available online). In order to apply for these funds, agencies should attend the MAG ITS Committee meetings where the applications are reviewed and discussed. Many agencies apply for TIP funding for projects that may already be captured in their CIP. The Town should consider this source for the capital projects listed as recommendations in this document. Occasionally, close-out funds are available at the end of the year to support additional projects, but the projects most competitive for this funding are usually smaller or do not include project design, because the turn-around time for using the funding is shorter than for TIP funding. Design Assistance Program The MAG Active Transportation committee allocates funds bi-annually to the MAG Design Assistance Program to support preliminary design activities for active transportation projects. These programs were initiated to encourage the development of pedestrian and bicycle facilities. A Town staff member should attend the MAG Active Transportation Committee meetings to apply for these funds. There are no match requirements other than staff time and data necessary to complete the project. The available funds for bicycle and pedestrian projects through the Design Assistance Program annually is $500,000. Traffic Signal Optimization Program (TSOP) MAG offers TSOP funds to help improve traffic signal coordination along corridors. The funding enables studies to optimize traffic signal timing and review of operations through simulation modeling. For fiscal year 2020, $420,000 was available for TSOP projects. Town staff should attend the MAG ITS committee meetings to apply for these funds.

Regional Funding	Safety Funds MAG administers the Highway Safety Improvement Program (HSIP) funding for each fiscal year totaling $1M per year. MAG issues a call for HSIP project applications for "systemic" and "spot" road safety improvements. This funding source could be used for applications such as, pedestrian

	crossings, increased bicyclist safety, and intersection upgrades at high crash locations. Town staff should attend the MAG Transportation Safety Committee meetings to apply for these funds. Roadway Safety Program The MAG Roadway Safety Program (RSP) was initiated in September 2019 by MAG to supplement the state's Highway Safety Improvement Program (HSIP) program. The RSP assists with providing additional funding in the short term. MAG will facilitate a Highway User Revenue Fund (HURF) swap and regional safety program that can improve the safety conditions of our roadways in all areas, from rural to dense urban. MAG developed this program to address these critical regional funding needs in the near term. The amount of RSP funds to be made available under a competitive call for projects process will be approximately $2 million in each fiscal year through 2024. Calls for projects will be issued on an annual basis in August. The Transportation Safety Committee will provide oversight to recommending a list of projects to be funded.
Competitive Grants	Competitive grants are generally led by agencies such as ADOT or MAG, with local agencies as partners. It is important to be involved in the MAG ITS Committee and other regional ITS partnerships like AZTech. Some potential federal grant opportunities could include: FAST Act Set-Asides (Congestion, Technology, Transportation Alternatives, STBG, etc.) Some portions of the Fixing Americas Surface Transportation are set aside for specific grants that change each year. These grants opportunities are based on the FAST Act legislation and its goals. There are small subcategories, "Set-Asides" that agencies can apply for through the TIP. The FAST Act emphasizes the need for data, analytical methods, and modeling techniques that are reliable, defensible, reasonably current, and meet quality requirements. Smart City Programs There are various programs that offer funds to projects introducing creative ways to implement Smart City technologies. These challenges and grants vary each year and are not necessarily continuous/reliable funding source each year. Competitive grant opportunities target a specific topic or goal but cover a large array of project types from improving technology and data usage to bicycle and pedestrian projects. Some unconventional grant opportunities that may have potential TSMO opportunities for disaster recovery and emergency communications could include those related to education, libraries, fire, and police. The Town should carefully review these grant opportunities and their requirements to identify if they can align with TSMO.
Development-Driven Projects	Coordinating with other roadway improvement projects is an impactful tool to leverage development-driven projects in support of TSMO. This method is considered "mainstreaming," and reduces the costs of multiple construction processes (permitting, right-of-way, utility clearance, etc.). The Town should utilize future roadway projects to simultaneously install TSMO recommended infrastructure and expansion efforts.
Private Funding	Public-private partnerships are an opportunity to share infrastructure or assets, although the Town needs to consider separation and security of assets prior to establishing these types of partnerships. Some private funding could come from partnership with a private entity, such as a foundation or investment fund. Some examples of these are Cisco Foundation and Venture Capital Investments. A variety of policies, agreements, or schedule coordination should be considered prior to entering into a private-sector partnership. Infrastructure implemented using federal transportation funding has some limitations for what they can be used for and by whom.

Grant funding should be researched throughout each year because the funding allocations and programs are constantly changing. Appendix K contains recommended meetings and funding application due dates to assist in staying on top of application deadlines and to make sure all necessary Town departments are on board with grant pursuits where applicable.

The Town should utilize online tools to view available grants and grant application techniques. Some of those tools include:

- Grants.gov
    - Search grants
    - Apply for grants
    - Grant policies
    - Grant-making agencies
    - Grant-writing tips
    - Workspace
        - Allows a grant team to simultaneously access and edit different forms within an application.
    - Grants learning center
    - Chatbot (FAQ's)
- U.S. Department of Transportation
    - Project and program grants
- Build America Bureau
    - Public-private partnerships
    - Financing

MAG has also created a manual titled "MAG Federal Fund Programming Principles, Competitive Project Selection Process for MAG Federal Funds." Within the manual are MAG's guiding principles, application processes, project selection processes, programmed federal fund projects, and various closeout processes. The manuals' appendices contain process flowcharts for selecting which projects the funds go to. The Town should review these processes to identify what MAG is looking for in applications and also review MAGs tips for grant application writing when applying for their funding available, to increase the likelihood of receiving needed funds.

7. Process for Review and Updates to TSMO Plan

The Town of Gilbert TSMO Plan is a dynamic plan that focuses on documenting current and future technology infrastructure, TSMO processes and plans that will impact TSMO functions throughout the Town as well as relationships between Town departments and with other agencies. To be consistent with changing needs and evolving technologies, this plan and the associated tools will require periodic updating and review as the TSMO Program continues to grow. As projects are implemented or expanded, as agency priorities change, or as other changes occur that impact technology and transportation operations in the Town, changes will be documented through an update to the TSMO Plan.

7.1 Responsibility

It is anticipated that the Town of Gilbert Traffic Engineer will have primary maintenance responsibility for the TSMO Plan document and associated tools. The Town Engineer and Public Works Director will need to support the Town Traffic Engineer in completing and pursuing strategies as defined in the TSMO Plan. The Town Engineer will make available the TSMO Plan and the Department Strategy Sheets and request progress check in/status of strategy activities during regularly scheduled meetings.

7.2 Plan Components to Update

- Appendices – All appendices are designed to be used immediately by the Town. As such, they should be considered living resources that are regularly updated for applicability. *Appendix C TSMO Strategy Details* will need to be closely monitored for completion and used as a checklist or action list to document when strategies are completed. The Town should use this strategy list as a means to talk through actions that need to be taken during regular progress or check-in meetings. As the Town moves closer toward completion of the strategies that reside on the "outsides" of the main diagram, the Town will need to look toward pursuing the overlapping strategies. In a few years, the Town will need to reevaluate the programming and phasing of the strategies and determine next steps related to each or related to new initiatives that may be impacting the TSMO program.
- GIS – GIS information contained in the various maps within this report (device locations and mapping of TSMO assets) will be provided to the Town to keep up to date.

Appendix A – Stakeholder Coord and Needs Assessment

Town of Gilbert

Transportation Systems Management and Operations (TSMO) Plan

APPENDIX A

Stakeholder Coordination and Needs Assessment

UPDATED FEBRUARY 2021 (ORIGINALLY CREATED AUGUST 2020)

Project #TS1930

gilbert

Kimley»Horn

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1. Introduction

The Town of Gilbert's (Town) Transportation Systems Management and Operations (TSMO) Plan marks an important step in the planning and continued evolution of the Town's transportation system. This TSMO Plan will help articulate the Town's vision and provide a roadmap to guide future decision making and investments as they relate to transportation operations. Leveraging the Maricopa Association of Government's (MAG) regional Systems Management and Operations (SMO) Plan, the Town is looking for a specific and unique TSMO Plan that will inform investments, resource development, and local operations.

The Town has invested in technology, systems, and staff to support the operations and management of the Gilbert transportation network. However, the Town recognizes that there are opportunities to make better use of existing resources, pursue initiatives, and more effectively plan for future technology investments to improve the Town's transportation operations. The TSMO Plan is an opportunity for the Town to map out a direction for the TSMO Program and plan a phased approach to improving traffic management, traveler information, incident management, inter-agency communications, and inter-departmental coordination to be more effective locally and regionally.

Gilbert TSMO Plan goals include:

- Improve mobility and safety of the transportation network. This includes identification of actionable and implementable recommendations. Funding, staff, and expertise are identified to support implementation of recommendations and effectiveness within the Town's Long-Range Infrastructure Plans.
- Provide guidelines for delivering traveler information to Town residents and the traveling public. The Town has prioritized its role in providing information and engaging with the public. Data can be collected and viewed in near real time. Historic data will also be available for comparison. The Town has necessitated effective means and methods for presenting and delivering information. Town staff must have a sound understanding of the requests from the public, the desires of Council/Manager's office and legal limitations.
- Deploy functional and cost-effective ITS infrastructure. All infrastructure is deployed with a purpose. Added benefit is realized when ITS infrastructure can be multi-functional in supporting and advancing the Town's goals and objectives.
- Share and integrate ITS projects and information with other Town departments and partner agencies. An evaluation of Town departments' ability to cooperate/share a variety of information and resources will identify areas where internal coordination can be improved. Similarly, an exploration of partnerships with adjacent and regional partner agencies will consider how partnering can help Gilbert in achieving its own goals while supporting regional goals.

The purpose of this report is to document the needs and issues identified through the assessment process including stakeholder discussions and the evaluation of existing Town documents and processes. The findings of the needs assessment will be used along with findings from the next task of the project, a State of Practice Report, to develop recommendations in a later task of the project.

2. TSMO Overview

TSMO focuses on the *people, processes, and technology* involved in the *implementation, management, and maintenance* of the transportation network.

TSMO is an approach to integrate planning and design with operations and maintenance to address both recurring and non-recurring congestion to maximize the safety, mobility, and reliability of the existing transportation network. While other planning efforts like the Integrated Mobility Master Plan focuses on planning the physical network and facilities that support mobility in Gilbert, the TSMO Plan focuses on planning, programming, designing and operating assets to actively manage the transportation network.

TSMO strategies are often applied across a network or an organization, rather than at an individual location, and many TSMO strategies require coordination across multiple departments, modes, and potentially jurisdictions. Examples of TSMO strategies include coordination activities such as traffic signal coordination, traveler information, special event management, integrated corridor management, work zone management, and traffic incident management While many TSMO strategies do involve a significant technology component, the TSMO toolbox also includes business processes, collaborative activities or partnerships, and engineering solutions to optimize the mobility and reliability of the existing system with limited resources.

The Town will benefit from the TSMO Plan because it:

- Establishes a consistent approach for succession planning, through development of a roadmap that can be followed regardless of staff changes over time.
- Identifies incremental steps for small wins that create momentum in the near-term.
- Contains cost-effective strategies for projects as well as processes, policies, or guidelines that allow the departments work together.
- Allows for data-driven decisions in the use of performance metrics and data for justification and evaluation of projects.
- Leverages multiple funding sources to identify funding opportunities that support transportation investments outside of traffic-specific funding sources, which could create multi-departmental benefits.
- Coordinates Town resources to avoid duplication of efforts and achieve increased efficiency in the expenditure of resources and staff time.

3. Assessment Process

Figure 1 shows the various types of data and steps needed to evaluate about the Town's current capabilities and assess the current state of the Town relative to its goals. This document captures the *known needs from stakeholders* presents the initial Town perspective. The next task of the project, the State of Practice document, will capture the remaining steps required to determine and develop the Town's TSMO vision, mission, and goals that will drive future strategy development and implementation.

Figure 1: Needs and State of Practice Process

4. Stakeholder Coordination and Input

To accomplish the level of stakeholder involvement desired for a TSMO Plan, Town staff representing many different departments and roles were invited to participate in stakeholder workshops and one-on-one or small group meetings to collect multiple perspectives on a variety of transportation topics.

4.1 Key Stakeholders

Representatives from the following Town departments were identified as being key to the TSMO conversation and were invited to participate in project workshops and one-on-one or small group meetings to provide additional input to the Town's TSMO Plan:

- Capital improvement Program (CIP)
- Development Services
- Digital Government
- Economic Development
- Engineering
- Finance and Management
- Fire and Rescue
- Information Technology
- Police
- Public Works
- Streets

Within each of these departments and divisions, stakeholders were selected to represent differing levels within the organization, including:

- Leadership: Department Directors, Town administration, and other leadership representatives that can provide oversight and institutional knowledge.
- Management: Department Managers related to transportation or ITS that deal with day-to-day challenges and constraints.
- Operations and Field Personnel: Operators and practitioners within applicable Town departments related to transportation that serve as the day-to-day implementers and maintainers.

4.2 Workshop #1 Summary

Stakeholder Workshop #1 was held on May 20, 2020 via a Microsoft Teams online meeting and was attended by a total of 35 Town representatives. The goals of the first stakeholder workshop were to provide general education on TSMO, gather information on existing and planned activities of each functional group, learn about each functional group's issues/concerns, and review the goals for the Town's TSMO Plan.

An interactive online survey tool was used to collect input from participants during the workshop. While there was representation from most departments throughout the Town, a majority of attendees were from Public Works/Engineering, as shown in Figure 2.

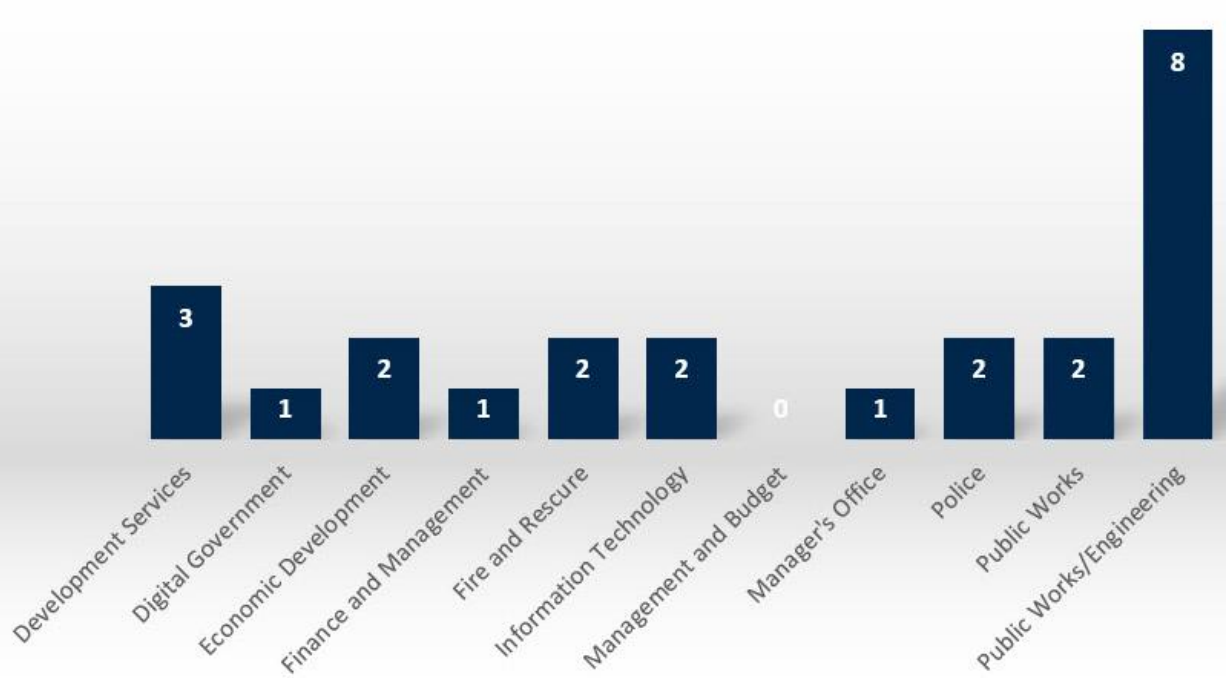

Figure 2: Workshop #1 Attendee Departments

Figure 3 shows the benefits that Town stakeholders articulated key benefits desired from this TSMO Plan. These included providing data and information to Town staff, managing system-wide traffic congestion, providing information to the public, and supporting public safety, among other benefits.

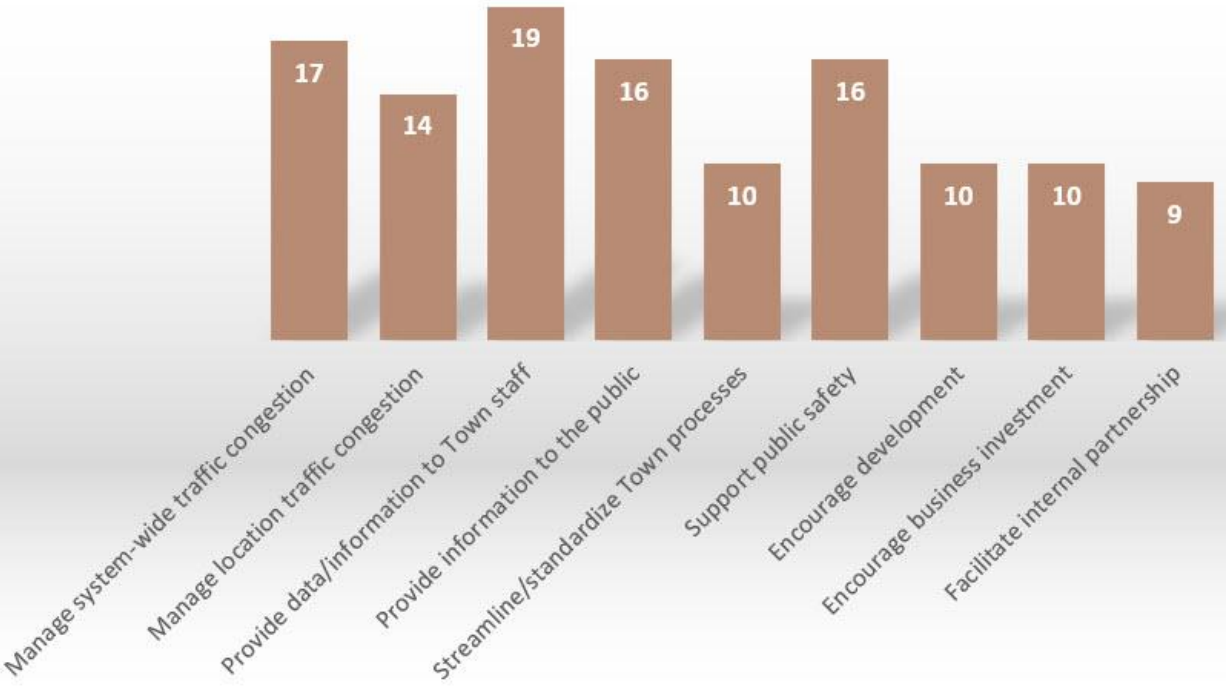

Figure 3: Desired Benefits of TSMO Plan

Stakeholders provided their input on how their department could participate in the TSMO Program, and the results of the online survey identified sharing data and information as well as support in implementing recommendations, as shown in Figure 4.

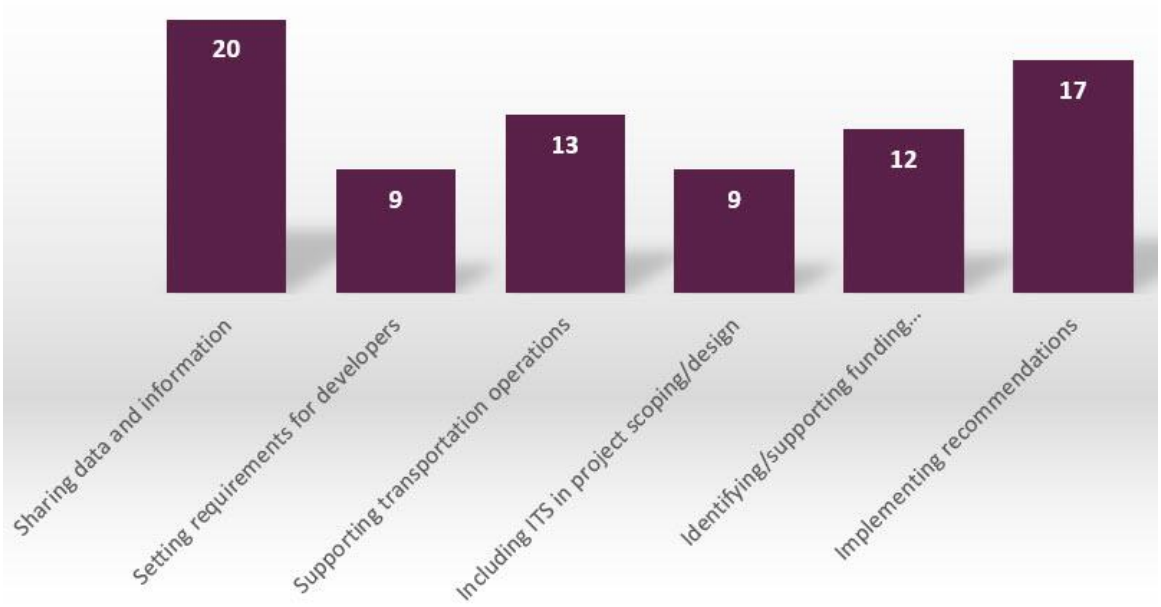

Figure 4: Departmental Support for TSMO Program

The topics that stakeholders felt should be TSMO priorities for the Town, as shown in Figure 5, included real-time information, sharing data, standardizing process, automating processes, and unifying systems and performance tracking.

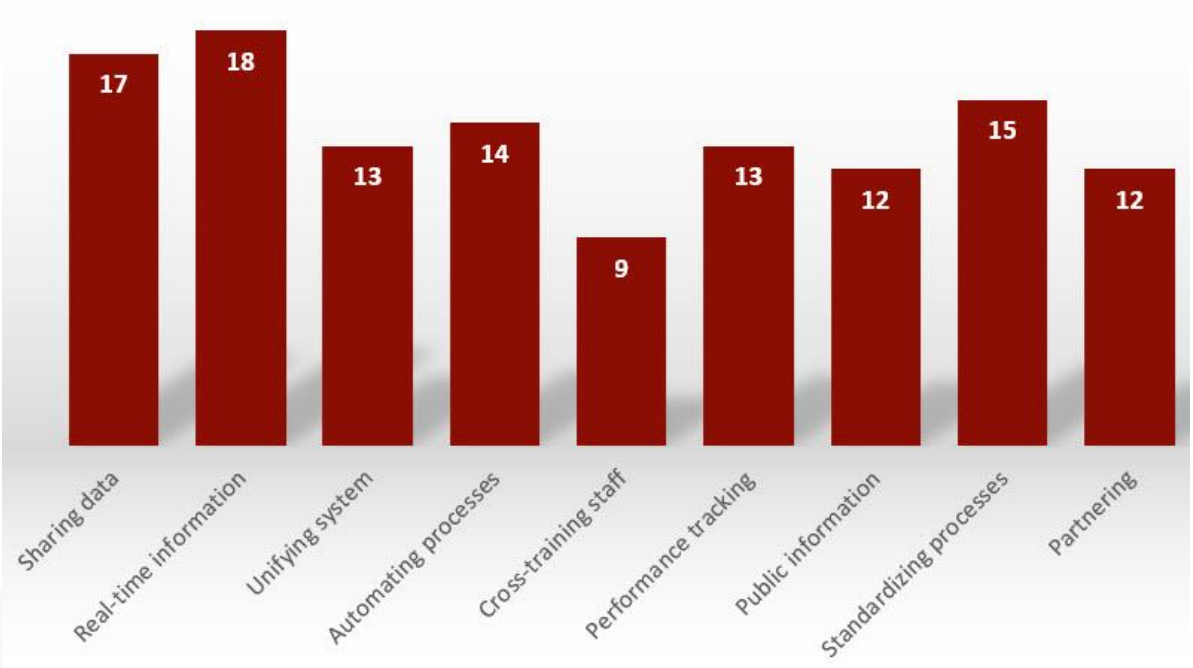

Figure 5: Desired Priorities for TSMO Program

4.3 Key Stakeholder One-on-One and Small Group Meetings

One-on-one and small-group meetings with representatives from individual departments and divisions were held between May 12, 2020 and June 18, 2020 to have more detailed discussions related to the department's interaction with the transportation network. This process facilitated more detailed and specific discussions than could be captured in a larger workshop setting.

The discussion during Workshop #1 provided specific topics to pursue during the one-on-one and small group meetings with each department. A total of 26 individuals from the following departments were part of one-on-one/small group meetings:

- CIP
- Development Services
- Digital Government
- Economic Development
- Engineering
- Fire and Rescue
- Information Technology
- Police
- Public Works
- Streets

Input obtained from these meetings provided not only needs and issues of what could be improved for more efficient and effective TSMO functions, but also provided context and details of the Town's current state of practice in the various TSMO functions. Input was formally summarized and provided to the Town Project Management Team.

4.4 Workshop #2 Summary

The second stakeholder workshop was held on June 22, 2020 to present the synthesis of what was heard during the one-on-one/small group stakeholder meetings and elicit feedback from the group to confirm, add, or clarify identified needs and opportunities for TSMO in the Town. The second workshop was held via a Microsoft Teams online meeting and was attended by a total of 27 Town representatives from various departments. The workshop also provided an opportunity to collect insights and perspectives on how the Town might begin to move transportation needs and opportunities into actionable strategies and improvements. The workshop also allowed for discussion and prioritization of key need areas that are important to focus on when developing this TSMO Plan.

5. Identified Needs, Issues, and Opportunities

The stakeholder input gathered through the various methods were reviewed and categorized into four main categories representative, are going to be grouped in the categories of *policies, projects, processes, and people* which encompasses the breadth and lifecycle of a TSMO Program.

Policies	Projects
Laws, regulations, standard, council direction	Specific projects that address TSMO needs and priorities
Processes	**People**
Operations processes, procedures, alignment with Town requirements	Staffing and workforce development, training, skill building

Needs, issues, and opportunities are identified within the category they align. Stakeholders fundamentally agree that this TMSO Plan needs to have a clear vision of what the Traffic Operations Center (TOC) should do and that recommendations as an outcome of this Plan must have clear owners identified in order to proceed with implementation.

Overarching themes that resonated with most, if not all, Town departments include:

- Town staff are advocates for making changes and improvements that are in the best interest of the Town's residents.
- Department and project managers must utilize data and performance measurement to support data driven investments and decision making.
- Managers should seek to be lean smart, utilizing resources efficiently but effectively to achieve the Town mission and the missions of individual departments.
- The Town wants to implement appropriate latest and greatest technologies that have been tested and proven by others.
- Project teams should generate recommendations that are scalable and flexible to provide the ability to respond to the environment and conditions in place when implementation is being pursued.
- Recommendations of the Plan should have clear owners/champions identified for implementation.

A summary of the TSMO Program needs, issues, and opportunities categorized into the four categories of policies, processes, projects, and people which are described below. These needs and opportunities were collected through stakeholder input as well as a preliminary evaluation of the Town's inventory and processes by the project team.

5.1 Policies

This category includes laws, regulations, standards, and Council direction.

- *Standardize Town-wide Platforms* – Standardize and institutionalize specific platforms that are utilized by multiple Town departments and that have proven to be useful and reliable – such as GIS, 311, etc.
- *Require Coordination Between Departments* – Formalize and institutionalize processes that facilitate coordination between Town departments to create the greatest and most efficient outcome. This will extend beyond Town Departments to other jurisdictions along key corridors, including coordination with neighboring cities, county, or state.

- *Use Data for Decision-Making in Transportation* – Use data to inform choices and decisions related to the transportation network – establish performance metrics that help define success and areas to improve.
- *Enable Data Security and Privacy* – Establish policies for the security, privacy, and use of sensitive operational tools, such as data and camera images and classification of these data sets.
- *Increase Accountability in Public Feedback Process* – Create steps that increase accountability as part of the process of collecting and responding to public concerns or input.
- *Provide Continuity Through Staff Transitions* – Create and standardize a foundation that provides continuity during staff transitions in the TSMO Program, including tools for succession planning and onboarding processes.

5.2 Projects

This category includes specific projects that address TSMO needs and priorities.

- *Develop Multi-Year CIP Plan* – Plan appropriately for future capital projects, including identifying funding early and creating appropriate budgets for identified projects.
- *Clearly Define Budgets* – Clearly define budgets within the appropriate departments to cover TSMO related responsibilities.
- *Identify Multi-Departmental Projects* – Capital and operational projects that support multiple departments with established roles and responsibilities for programming and implementation.
- *Improve and Activate Existing Technology* – Identify gaps in the ability of current technology to achieve goals and recommend replacement/transition to address shortcomings.
- *Leverage Technology for Data* – Leverage existing technology and pursue new technologies to obtain and use the maximum amount of data to support multiple department purposes.
- *Centralize Record Drawings* – Record drawings of existing infrastructure should be accessible by other departments that utilize the existing infrastructure.
- *Establish Data Viewing* – Establish the ability to view active construction, lane restrictions, and real-time (or near real-time) or historical data traffic conditions (red, yellow, green) through a portal viewable by other departments within the Town. Making data viewable will require making sure the data that is being shown is accurate and reliable.
- *Share Data with Public* – Collect and share data (travel delays and traffic impacts) with the public and include the source of the data and reliability of the data to allow further use by other departments as well as supporting Town industry development focus in science, technology, engineering, arts, and math (STEAM).
- *Integrate Systems* – Consolidate the number of traffic control systems used to remotely manage the ITS infrastructure and traffic signals in the Town to support efficient management.
- *Create Asset Management Program* – Establish a Long Range Infrastructure Plan (LRIP) and process for TSMO field and support equipment (such as intelligent and dynamic infrastructure to manage transportation operations).

5.3 Processes

This category includes operations processes, procedures, alignment with Town requirements.

- *Document Responsibilities* – Document and formalize the relationship and individual responsibilities for interdepartmental coordination as related to technician/inspection, construction, work zones, barricades used during work zones, project development, incident management, permitting requirements, development of other Town or area plans, and other topics.

- *Increase Intentional Coordination* – Intentionally coordinate with partner departments to take advantage of skill sets and support proactive coordination for scoping, plan review, operations, data analysis, traffic control plan review (such as including TOC and Economic Development), and public information dissemination.
- *Standardize Infrastructure Construction* – Review and update transportation infrastructure standards in use for project development each year including fiber sharing between Departments.
- *Standardize Traffic Processes* – Standardized traffic processes such as signal timing procedures, signal warrant process, and data management while maintaining enough flexibility support the use of engineering judgement. Periodically review and update procedures, as necessary.
- *Use Inter-Departmental Data* – Make available real-time information to better manage asset uptime, work zones, and incidents that is utilized by not only the TOC, but also other departments in their pursuit of their public service missions.
- *Use Technology to Perform Tasks* – Utilize technology to more efficiently accomplish tasks (such as conducting speed studies if necessary, collecting traffic volumes/counts, or collecting turning movement counts). This could include automation and orchestration to accomplish simple tasks allowing staff to focus on higher business value outcomes.
- *Establish TOC Support Expectations* – Standardize the use of technologies by the TOC as well as service levels to support training, communications, and consistency in working with other departments, neighboring communities and the region.
- *Schedule Activities into Year* – Schedule periodic reviews of key documents and standards for TSMO, such as this Plan, infrastructure and traffic process standards, interdepartmental coordination, current contracts, development codes or Town policies, and funding/grant opportunities. This should be completed with the various Departments to collaborate on opportunities and provide presentations to various group meetings within the Town.
- *Conduct Proactive Maintenance* – Conduct regular and proactive preventative maintenance of fiber and ITS infrastructure to ensure data is available when needed.
- *Document Decision-Making* – Document the history of decisions made related to transportation and TSMO and the inputs into the decision-making process.
- *Create Plan for Big Data Use* – Create a roadmap for big data and how it will be captured, translated into information, used for internal processes, and disseminated to the public.

5.4 People

This category includes staffing and workforce development, training, and skill building.

- *Evaluate Staffing Needs* – Evaluate the appropriate staffing and skill set needs for various TSMO roles to support performance-based success measures for the TOC and preventative and responsive maintenance of field devices.
- *Story Tell for Transportation* – Tell a comprehensive, metric/data-driven transportation story and utilize Digital Government more for Traffic and Public Works purposes.
- *Analyze Data for Information* – Focus and support data analysis and activation and not just collection without turning into understandable and meaningful information.
- *Train on Tools* – Develop and leverage training to keep staff knowledgeable and engaged, especially when related to technology which can change rapidly.
- *Liaise with Other Departments* – Liaise more regularly with IT and Digital Government to support data consumption, security, and usage most effectively.
- *Report on Performance Metrics* – Set performance metrics and reporting procedures for traffic data, such as travel times, crash data, and delays.

5.5 Prioritization Summary

During Workshop #2, stakeholders were asked to prioritize the list of needs that were synthesized for each of the four categories from the perspective of their department. The results of needs prioritization are described in this section.

All TSMO needs that were identified are intended to be addressed by an actionable strategy as part of this Plan. While the results from this survey provide a snapshot of the priorities of the stakeholders that attended Workshop #2, they also align with input collected during the one-on-one/small group meetings.

The top 'policy' needs that stakeholders felt should be TSMO priorities for the Town, as shown in Figure 6, included *requiring coordination between department*, *using data for decision-making in transportation*, and *standardizing Town-wide platforms*.

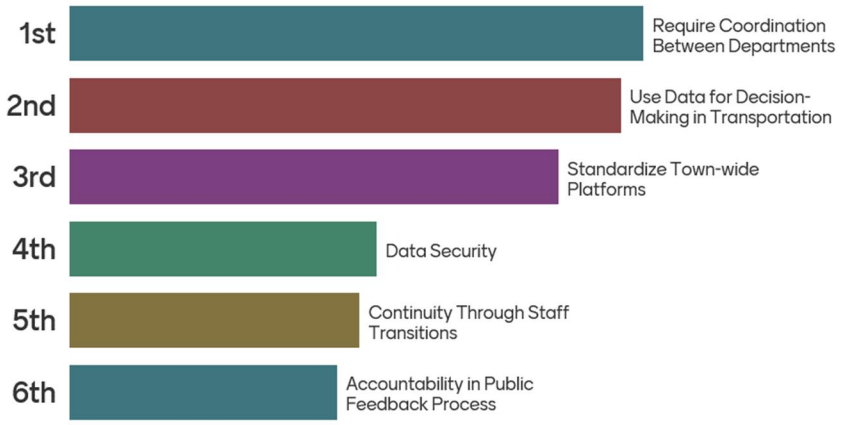

Figure 6: Priority Policy-Related Needs

Survey input identifies high-priority 'project' needs, include *leveraging new technology*, *real-time (or historical) data viewing*, and *aligns with other plans* which means making sure the right departments and planning activities are involved in project planning through implementation, as shown in Figure 7. While not indicated in the figure, workshop participants also emphasized the importance of leveraging existing technology and activating that technology in more ways than are utilized currently.

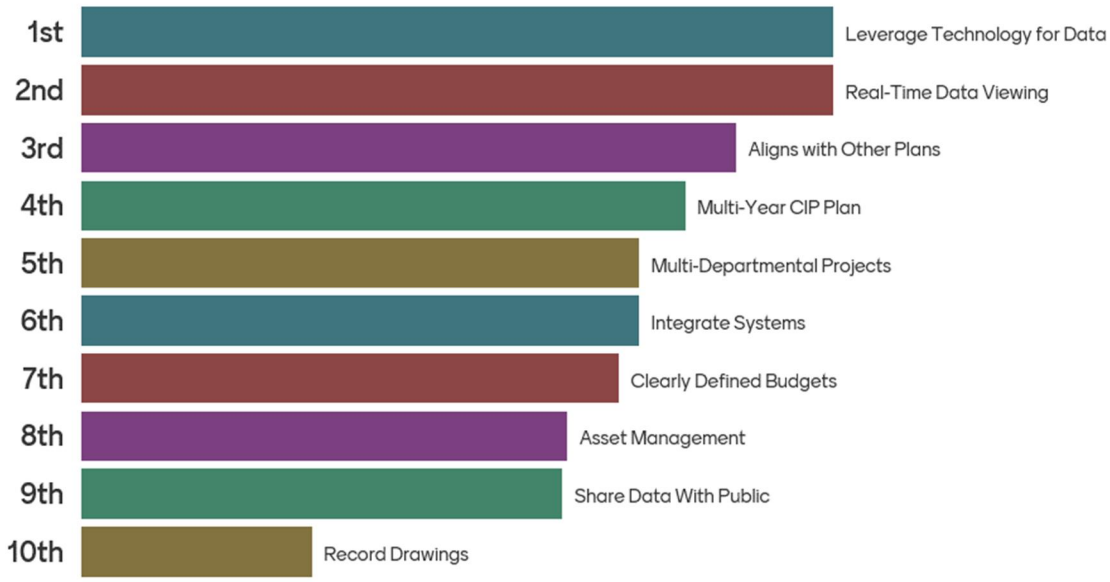

Figure 7: Priority Project-Related Needs

Figure 8 provides input on high-priority 'process' needs with higher priorities being *intentional coordination*, *standardizing traffic processes*, *documenting responsibilities*, and *developing infrastructure standards*.

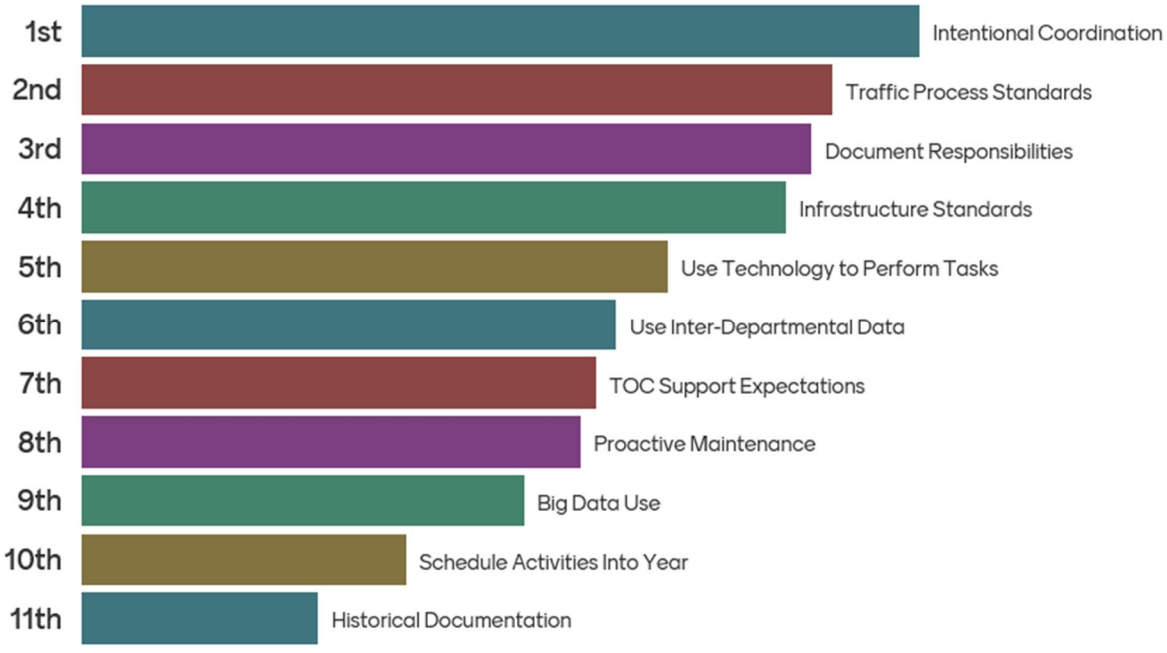

Figure 8: Priority Process-Related Needs

Priorities related to 'people' needs are shown in Figure 9 and include *analyzing data to turn it into information*, *evaluating staffing needed to support the TSMO Program*, and *training on tools* especially considering the evolution of technology. Participants noted during the workshop that the 'people' needs

were harder to prioritize than the other categories as they were all seen as foundational for a successful TSMO Program in the Town.

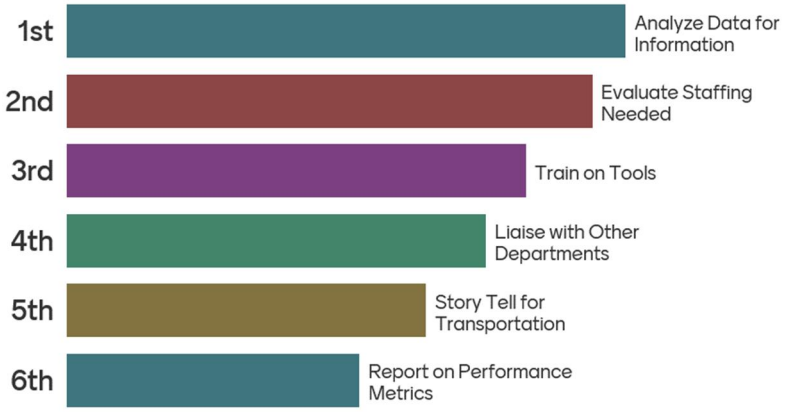

Figure 9: Priority People-Related Needs

Appendix B – State of Practice

Town of Gilbert

Transportation Systems Management and Operations (TSMO) Plan

APPENDIX B

State of Practice

UPDATED FEBRUARY 2021 (ORIGINALLY CREATED SEPTEMBER 2020)

Project #TS1930

gilbert

Kimley»Horn

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List of Acronyms

ADOT – Arizona Department of Transportation
ARID – Anonymous Re-Identification Devices
ASC – Advanced System Controller
ATMS – Advanced Traffic Management System
CAD – Computer Aided Dispatch
CCTV – Closed-Circuit Television
CIP – Capital Improvement Program
CMM – Capability Maturity Model
EOC – Emergency Operations Center
EVP – Emergency Vehicle Preemption
G – Gigabit
GIS – Geographic Information Systems
IT – Information Technology
ITS – Intelligent Transportation Systems
LRIP – Long-Range Infrastructure Planning
MAG – Maricopa Association of Governments
MDT – Mobile Data Terminal
PIO – Public Information Officer
PTZ – Pan, Tilt, Zoom
RCN – Regional Community Network
ROW – Right-of-Way
SM&O – Systems Management and Operations
TCP – Traffic Control Plan
TI – Traffic Interchange
TIP – Transportation Improvement Program
TSMO – Transportation Systems Management and Operations
TOC – Traffic Operations Center
TRWC – TOPAZ Regional Wireless Cooperative
TSOP – Traffic Signal Optimization Program
UAV – Unmanned Aerial Vehicle

1. Introduction

The Town of Gilbert's (Town) Transportation Systems Management and Operations (TSMO) Plan marks an important step in the planning and continued evolution of the Town's transportation system. This TSMO Plan will help articulate the Town's vision and provide a roadmap to guide future decision making and investments as they relate to transportation operations. Leveraging the Maricopa Association of Government's (MAG) regional Systems Management and Operations (SM&O) Plan, the Town is looking for a specific and unique TSMO Plan that will inform investments, resource development, and local operations.

The Town has invested in technology, systems, and staff to support the operations and management of the Gilbert transportation network. However, the Town recognizes that there are opportunities to make better use of existing resources, pursue initiatives, and more effectively plan for future technology investments to improve the Town's transportation operations. The TSMO Plan is an opportunity for the Town to map out a direction for the TSMO Program and plan a phased approach to improving traffic management, traveler information, incident management, inter-agency communications, and inter-departmental coordination to be more effective locally and regionally.

This State of Practice Report documents an inventory of existing intelligent transportation system (ITS) devices and other existing, but underutilized, infrastructure that could support ITS in the Town of Gilbert. ITS includes communications and field technologies that are integrated into the transportation network such as traffic signals, cameras, fiber optic communications, and central management software. The intent of this inventory is to properly identify gaps in and potential strategies for the Town's TMSO program.

As part of this inventory effort, an analysis of the Town's existing Traffic Operations Center (TOC) was performed, including collection of existing network equipment, software used, and processes used by operators and managers. The regional Transportation Improvement Program (TIP) managed by the MAG and the Town's Capital Improvement Program (CIP) were reviewed to determine the programmed infrastructure and systems in the Town that we could coordinate with to improve Gilbert's ITS system/program. The latest available information from the Town's Fiber Optic Strategic Build Out, which is currently in development, was incorporated into this analysis, as coordinating this TSMO Plan with that Plan will be key to aligning outcomes. An evaluation was performed to identify available staff to support the ITS program, including current resources dedicated to management, planning, design, operations, and maintenance of the ITS program. These steps are summarized in this State of Practice report.

Figure 1 shows the various types of data and steps needed to evaluate the Town's current capabilities and assess the current state of the Town relative to its TSMO goals. This document captures the *current processes*, *current inventory*, *current plans/programs* and outcomes from the *Capability Maturity Model (CMM) Assessment*. This document will outline the Vision, Mission and Goals for TSMO in Gilbert and document the State of Practice for processes, staff, infrastructure, systems, and other resources related to transportation operations and management in the Town. Evaluating the existing State of Practice against the Vision, Mission, and Goals will help identify key gaps that will need to be addressed in the next phase of the project that includes strategy development and implementation steps.

Figure 1: State of Practice Process

2. TSMO Vision, Mission and Goals

Having a clear and agreed-upon vision, mission, and goals for TSMO in Gilbert is critical to guide this TSMO Plan effort and help create direction for the TSMO Program at the Town. These three cornerstones are related but individually necessary to articulate what is intended to be accomplished and how it will be accomplished. TSMO goals were established prior to this project and have been adjusted as noted below reflecting the assessment of the Town's state of practice.

TSMO Vision

Improve safety and mobility for all modes of transportation by integrating planning, design, operations and maintenance activities that supports the Town in striving to be a Town of the Future.

TSMO Mission

Work together as a Town to provide Gilbert residents and visitors with a proactive, responsive, and comprehensive transportation network that promotes quality of life and supports economic growth.

TSMO Goals:

- Data: Collect and utilize real-time data evaluated against performance metrics to support operational decision making and response to events.
- Customer Service: Deliver accurate and reliable traveler information to Town residents and the traveling public so they can make informed mobility decisions.
- Infrastructure: Make functional and cost-effective transportation infrastructure investments that serve safety and mobility purposes.
- Integration: Prioritize TSMO as a core objective in the agency's planning, design, construction, operations and maintenance activities of the transportation network to serve Town purposes as well as the role in the regional transportation system.
- Investment: Leverage opportunities to sustain funding, staffing, and infrastructure resources to support the operations and management of the transportation network and its assets.
- Consistency: Establish succession planning, documentation, and training in TSMO activities that creates the opportunity to improve what has been established over time.
- Efficiency: Implement projects that optimize existing transportation system capacity and alleviate congestion.

3. Asset Inventory

3.1 Traffic Signals

The Town of Gilbert currently (as of 1/2021) has a total of 213 signalized intersections. There are 60 major-arterial traffic signals and 117 major-minor traffic signals that the Town owns, maintains, and operates. The Town has 11 Fire Station locations that have signalization, and 13 signalized trail crossing locations (9 traffic signals and 6 high-intensity activated crosswalk beacons). There are 4 traffic signals located at freeway interchanges that are owned by the Town, as the Town has an agreement with Arizona Department of Transportation (ADOT) to own and maintain traffic signals that have been paid for and constructed by ADOT. Additionally, there 3 span wire locations and 9 pairs of school zone flasher locations that are not included in the total signalized intersection count. There are several signalized intersections that lie on the border of the Town of Gilbert and the adjacent cities (Mesa, Chandler, and Queen Creek) that are not owned or operated by the Town.

Figure 2 shows the existing traffic signals owned by the Town.

The Town uses Econolite traffic signal controllers at each traffic signal location with Advanced System Controller (ASC/3 or Cobalt controllers). The Town Streets department owns all devices related to the operation of traffic signals (excluding ITS equipment), including traffic signal structures, detection cameras, controllers, cabinets, and emergency-vehicle preemption.

The TOC and Streets Department owns and is responsible for the additional equipment at traffic signals that includes communications equipment to connect the traffic signal to the TOC central management system and devices that collect additional data at the signal location for TOC and traffic engineering use. Equipment owned by Streets includes network switches and video detection cameras. Equipment owned by the TOC includes fiber cable, fiber equipment, Wavetronix vehicle detection, anonymous re-identification (ARID) devices, pan-tilt-zoom (PTZ) closed-circuit television (CCTV) cameras, and Gridsmart cameras.

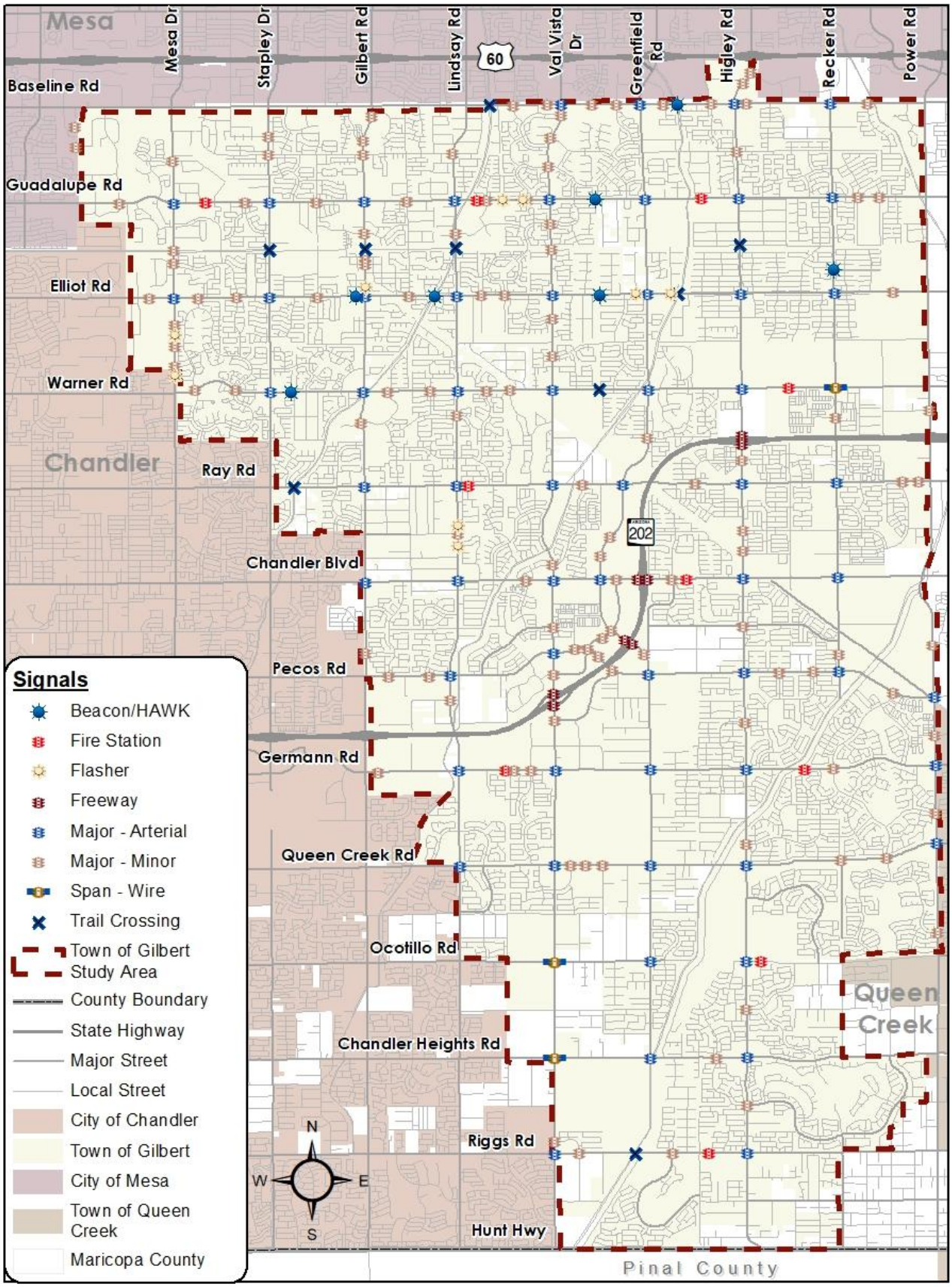


Figure 2: Existing Traffic Signals

3.2 Communications

Communications infrastructure is important for connecting traffic signals and other ITS devices to the TOC so that TOC staff have the ability to monitor or make changes to traffic signals or other devices at the intersection in real time. There are a total of 1186 different devices currently on the traffic communications network. All of the Town's traffic signals are connected via fiber optic or wireless infrastructure and communicate back to the TOC.

The Town's fiber optic communications network is comprised of four planned backbone rings of fiber optic cable: one existing core ring and three planned outlying rings. The core ring and northwest ring are fully built out, while the northeast and south rings are partially built. Fiber optic branch cables extend from those four rings at several locations to connect to nearby traffic signals and Town facilities. There are two fiber runs, one near Baseline Road and Higley Road and the other on Riggs Road, that are connected to the fiber rings via wireless communications.

Current Town standards require 144 strand fiber cables to be installed with new installations and new projects. In many places, including the majority of the built-out rings, the fiber optic cables are 48 or 96 strand and are installed in conduits of various sizes. Current Town standard requires the use of two 4" conduits for any new fiber run. Standard demarcation between TOC and IT (Information Technology) fiber is at communications room where the inside plant fiber (that runs inside of buildings) standards for equipment and design are used. There are no ITS or fiber standards other than splitting up fiber cables so half (48F in a 96F cable) are designated for the Traffic network and half for the Townwide IT network. The TOC keeps detailed records of fiber cables, including details on specific buffer tubes and fiber cables allocated to specific paths throughout the Town. Table 1 below shows a summary of fiber optic communications infrastructure throughout the Town.

Table 1: Communications Infrastructure Summary (as of 01/2021)

Infrastructure	Quantity
Total miles of Fiber	74.4
Fiber optic access points	175
Fiber optic splice closures	171
Switches	221
Ethernet converters	206
Wireless radios	134

The TOC installs, owns, and maintains all outdoor fiber and conduit. At the point of entry into any facility or at the termination panel, ownership belongs to the IT Department. Town facilities are connected to the fiber network, with exception of three Fire Stations, some well sites, and some lift stations. A full list of facilities and how they are connected to the network can be found in the documentation as part of the Fiber Optic Strategic Build Out project which is being completed to evaluate the Town's current fiber optic network and document a strategy for expansion of the network as well as how to ensure redundancy.

In December 2017, Gilbert implemented a streamlined program for permitting of small wireless facilities in municipal rights-of-way, allowing wireless companies to install small cell infrastructure on streetlights, traffic signals and other utility poles to support the growth of 5G in the community.

Figure 3 shows the existing fiber optic network and Town facilities, and Figure 4 shows wireless devices within the Town.

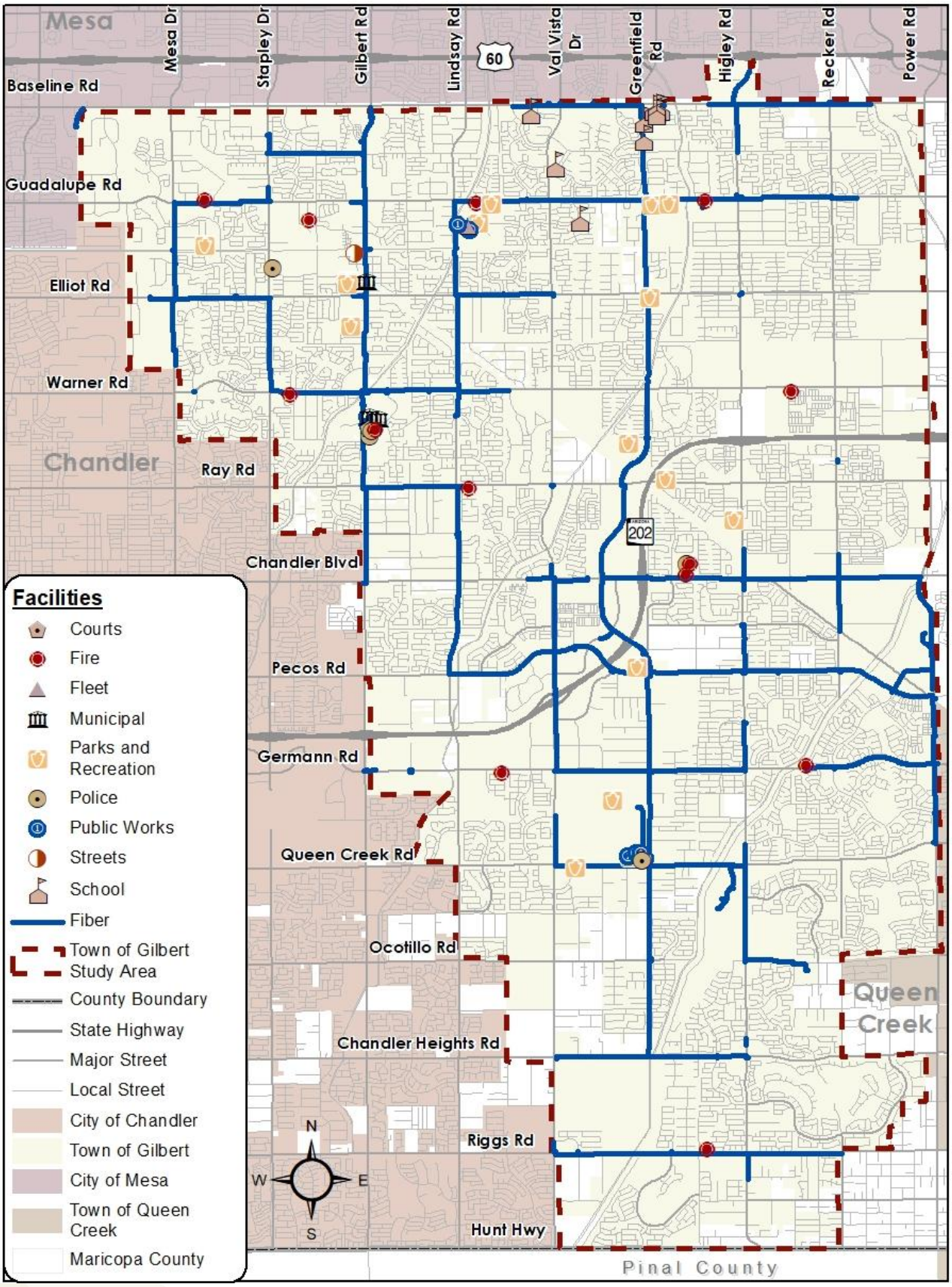


Figure 3: Fiber Optic Network and Town Facilities

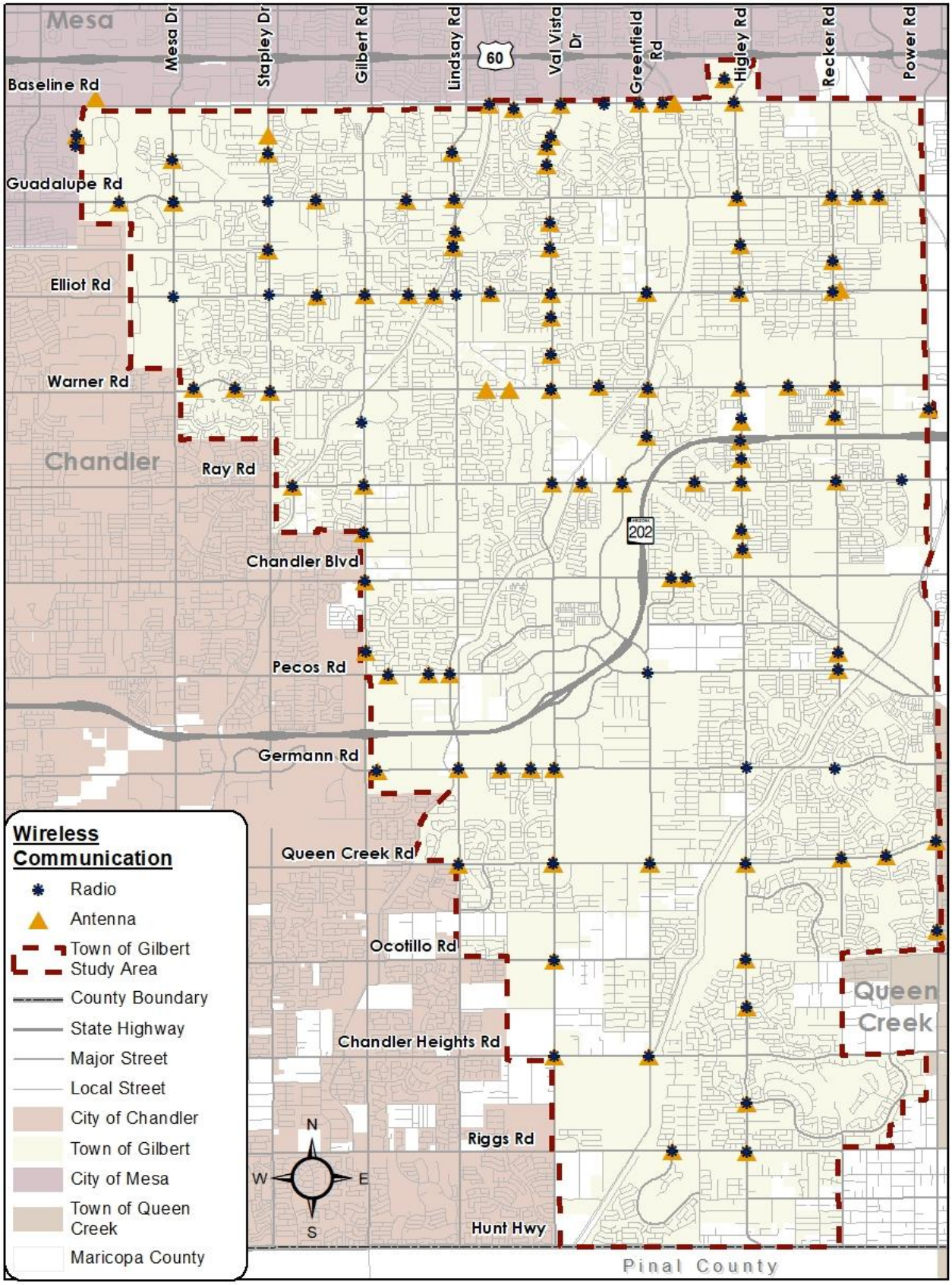


Figure 4: Wireless Communications

3.3 Real-Time Monitoring and Response

Devices to support real-time monitoring and response enhance operations to support more than just the movement of vehicles. Monitoring of intersections can help to identify equipment malfunctions (such as a traffic signal in flash) and detect and verify incidents that may occur at an intersection. Response devices help public safety vehicles get to incidents more efficiently. Traveler information devices help collect and provide information to the traveling public. This section summarizes real-time devices used throughout the Town.

Cameras

Currently, there are 127 CCTV cameras all located at traffic signal locations. Town CCTV cameras are able to be PTZ controlled from the Luxriot central software system at the TOC. The TOC is able to view all video detection and PTZ cameras remotely and can change configuration as needed.

The real-time intersection video feeds from Luxriot are provided to staff at the 911 call-center, Emergency Operations Center (EOC), and to some individuals within the Police and Fire Departments. There is currently no capability, nor desire, to record video at the TOC due to record retention requirement reasons.

The Town Police department is investing in software that can analyze video for information. There are additional cameras that Police deploy in Unmanned Aerial Vehicles (UAVs), such as drones, that are used during major incidents or for surveillance from a distance for criminal or civil unrest.

There are some cameras in parking garages in the downtown Heritage District area that are used for parking management purposes and not currently shared with others. The TOC has a fiber branch that connects these cameras to the communications network, but the TOC does not view or control these cameras.

Figure 5 shows the locations of the TOC owned PTZ cameras located at traffic signals.

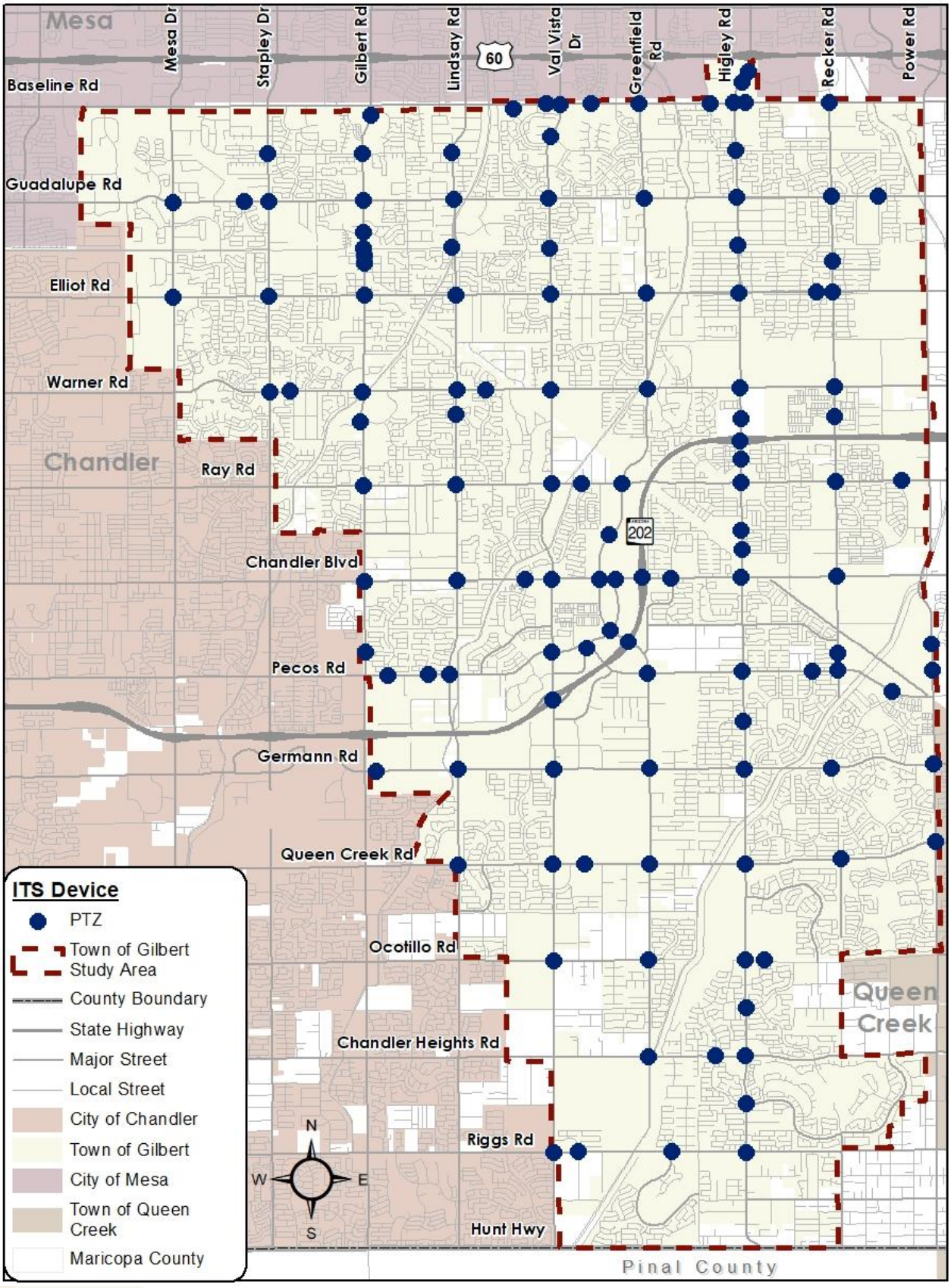


Figure 5: CCTV Camera Locations

Vehicle Detection

There are 650 video detection cameras used for detecting traffic at intersections to inform signal phasing and timing. There are also 72 radar Wavetronix detectors that are used for advanced detection which helps detect vehicles in the dilemma zone (see Figure 6) and can extend the green time to allow vehicles to safely travel through the intersection. Some of the detection cameras also all have the capability of advanced detection, and many are programed across the Town for this purpose as well. Figure 7 shows the traffic signals that are equipped with vehicle detection and the type of detection used.

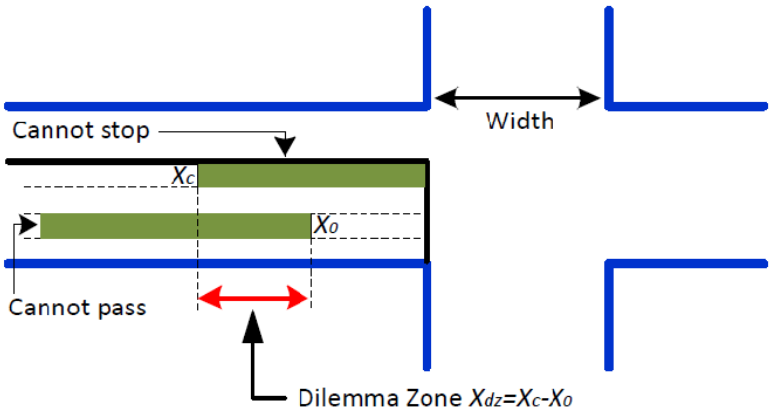


Figure 6: Advanced Vehicle Detection at Traffic Signals

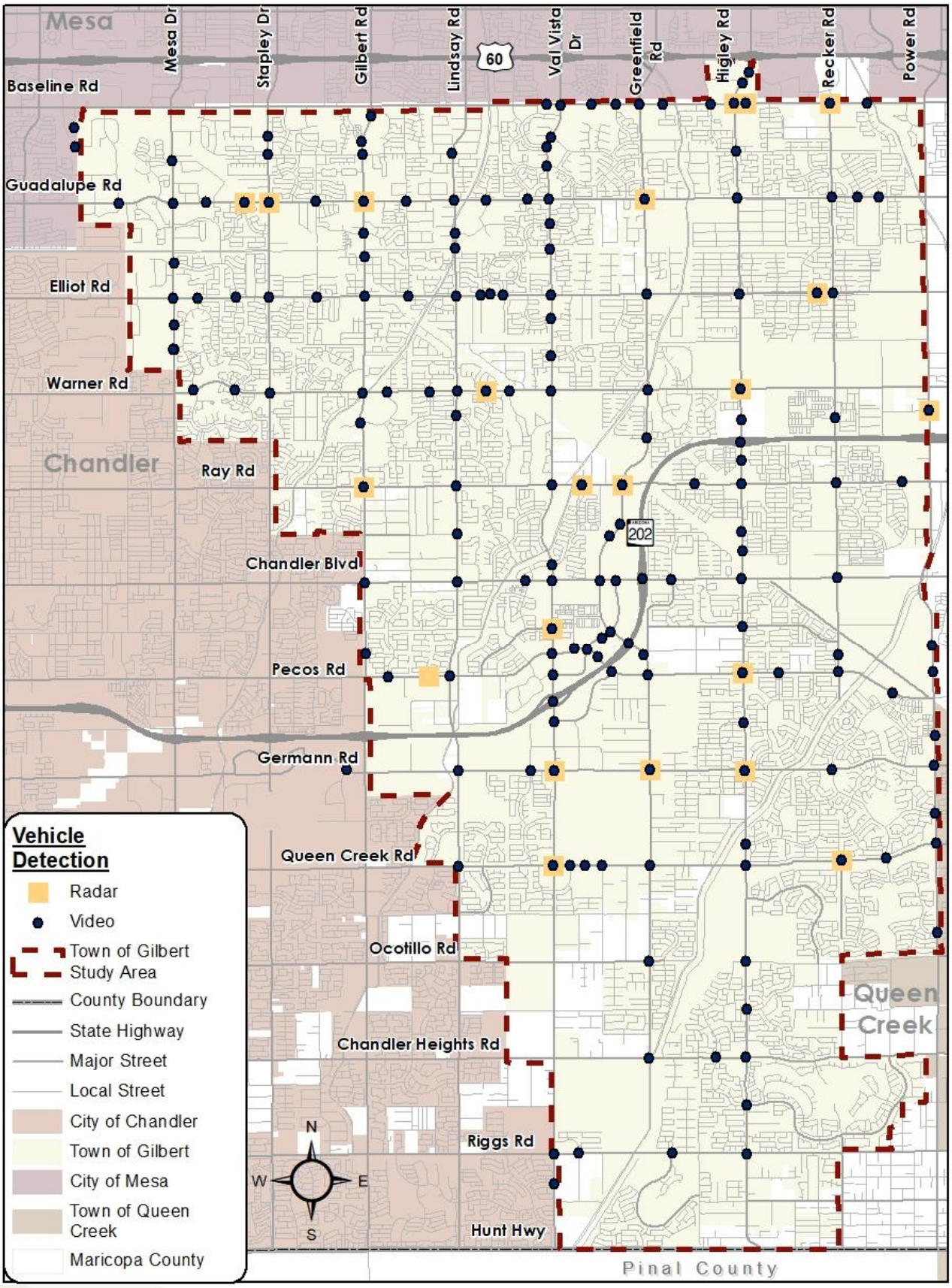


Figure 7: Vehicle Detection at Traffic Signals

Other ITS Devices

The Town currently has 2 Dynamic Message Signs (DMS) installed. One located on Gilbert Road southbound midway between Chandler Boulevard and Ray Road. The second DMS is also located on Gilbert Road southbound between Baseline and Guadalupe. The DMS are both Daktronics and are connected to the web and TOC via fiber communications. The TOC owns the DMS and is responsible for configuring and displaying the messages. The Streets Department maintains the DMS as part of their regular preventative maintenance checks.

There are currently 82 ARID devices located throughout the Town. The data provided from the ARID devices allows for the calculation of travel times along corridors. The TOC is able to see the City of Mesa and City of Tempe's ARID device information as part a regional TIP project that initiated the installation of ARID in the east valley agencies. The real-time and historical travel time information is sent to the regional traveler information sources, including ADOT's 511 website (although not currently active due to an upgrade in ADOT's 511 system) and the Regional Archived Data System (RADS) through the Regional Community Network (RCN) regional fiber optic communications backbone. The Town and MAG use this data for before and after studies as well as traffic signal optimization program (TSOP) studies. There are no current plans for expanding ARID devices in the Town. The TOC installed the ARID devices that expanded the original regional TIP project to broaden the data collection abilities. The TOC installed them, programmed them, and maintains them with support from Streets for installation and maintenance as needed. Figure 8 shows the locations of the ARID devices throughout the Town.

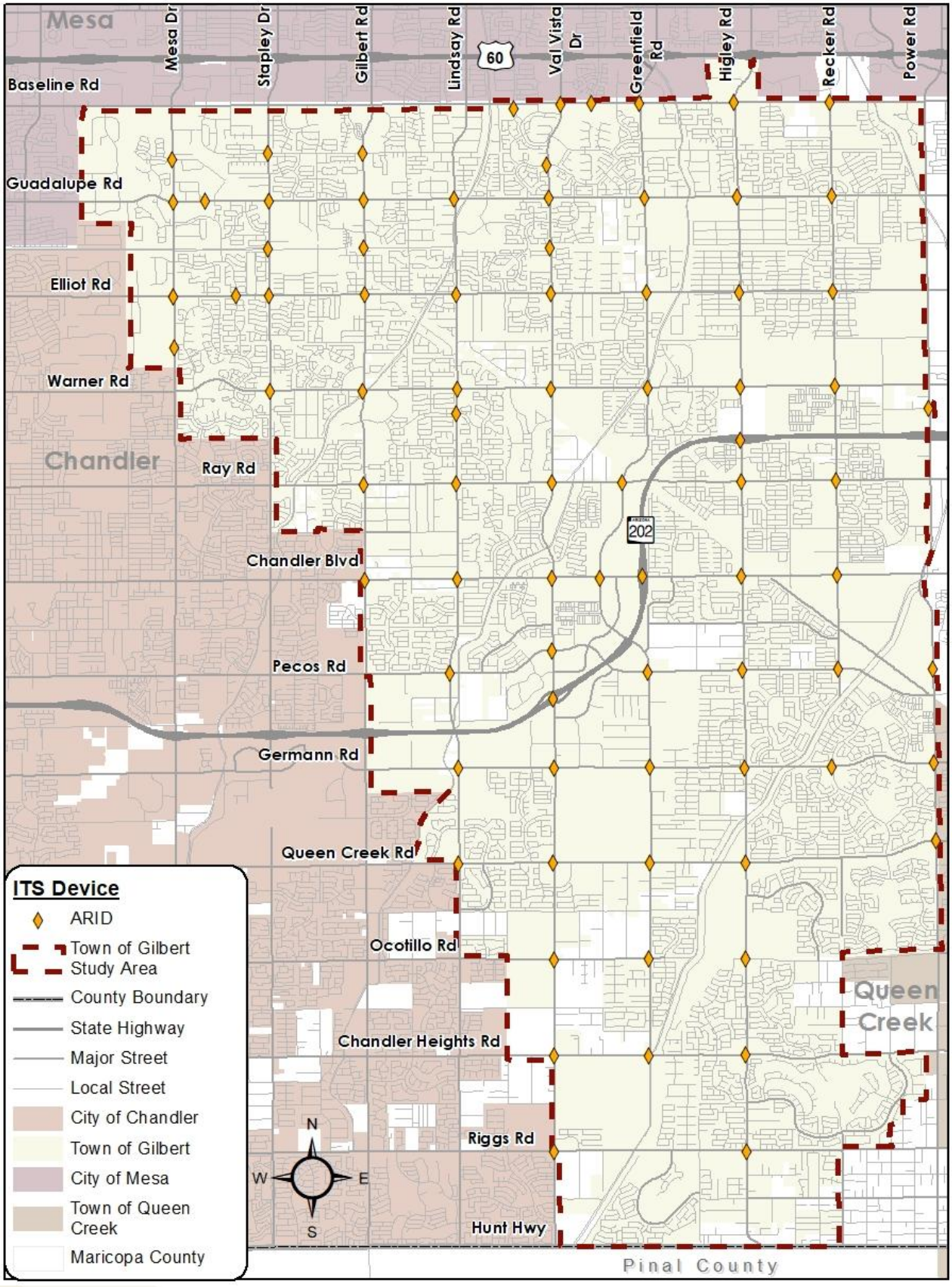


Figure 8: ARID Device Locations

Emergency Response

Emergency Vehicle Preemption (EVP) is used to provide emergency response vehicles, such as fire trucks, with priority signal phasing at intersections. EVP allows equipped vehicles to communicate with the traffic signal to indicate that the vehicle is approaching the intersection, and this communication directs the traffic signal to provide a green signal phase in the direction of the emergency vehicle to allow it to pass through the intersection safely.

Currently, the City has EVP devices on every fixed traffic signal that is not a temporary signal, with the exception of two signalized trail crossings. Town Police, Fire, Ambulance vehicles, TOC vehicles, and Signal Technicians are outfitted with pre-emption technology to communicate with all traffic signals. It is this wide ranging use of EVP at the Town that Fire vehicles are not able to utilize EVP in other jurisdictions that restrict their EVP users to only Fire vehicles.

Alternative Modes of Transportation

Understanding the operations and network for other modes of transportation beyond cars, including bicycles, pedestrians, and transit, is important to provide a holistic view of traffic operations in the Town. TSMO strategies and some specific ITS technologies have the ability to support safety and efficiency of transit, bicycle, and pedestrian travel, as well as provide improved traveler information and real-time data that is available to the Town on these other modes. Understanding the complete transportation and mobility network in the Town will also help identify critical corridors were TSMO strategies can or should be targeted.

The Town has several corridors that have bus routes that are currently operated by Valley Metro. Existing bus routes and the Town's network of bicycle facilities and multi-use paths are shown in Figure 9.

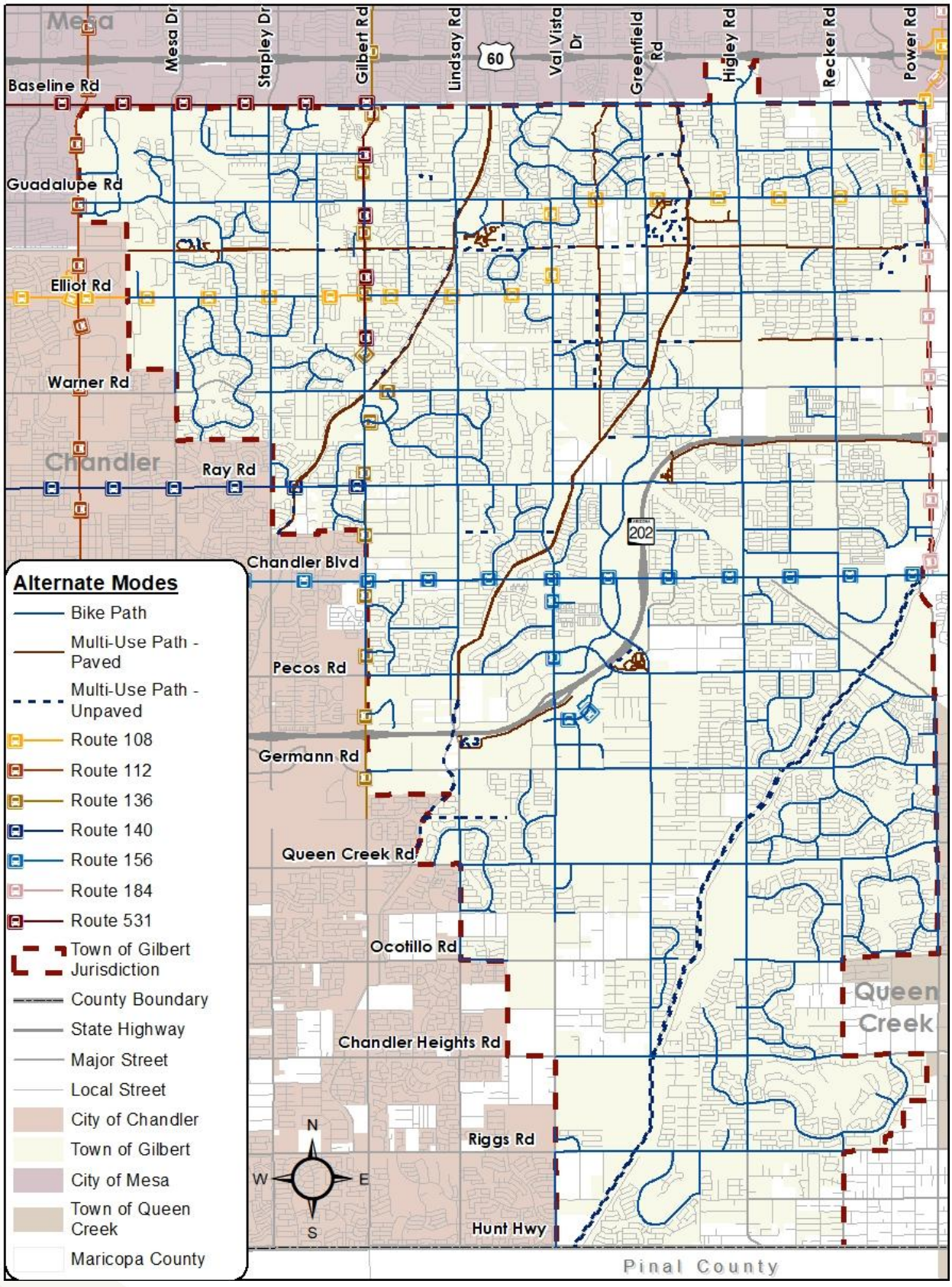


Figure 9: Alternative Modes of Transportation

4. TOC Analysis

4.1 Central Software

The Town's Advanced Traffic Management System (ATMS) is mostly used to support day-to-day traffic signal timing adjustments, document changes in timing records, and to access historical logs of traffic signal and other device activities. TOC staff has the ability to remotely access to the ATMS to be able to make signal timing adjustments without sitting in the TOC. There is a separate camera central system, the Luxriot central management system, used by the TOC to view and control intersection cameras. The TOC does use some analytics at times on a case-by-case basis, such as using the split monitor and time-space diagram. Using analytics provided by the ATMS can help respond to citizen concerns, help technicians with trouble shooting signal related issues, and respond to emergencies.

Licenses and software support for the use of Luxriot is provided to the Town for free by MAG. Because all agencies in the region utilize Luxriot, the Town has access to neighboring jurisdiction camera feeds, which are particularly beneficial along multi-jurisdictional corridors when major traffic incidents or closures that may impact operations across jurisdictional lines.

TOC staff has remote access to the ATMS system for logging in from home or work to be able to make signal timing adjustments as needed. In general, data generated by the TOC and the connected devices is not currently used by the TOC to support decision-making related to real-time traffic operations.

4.2 TOC Processes

Signal timing is conducted by the Engineering group. Formal Town signal timing standard operating procedures are not currently in place but are in the process of being developed. Signal timing plans include school session, morning peak (AM), mid-day, afternoon peak (PM), off-peak, and sometimes special events or construction, as needed.

The Town has an outdated Townwide traffic signal timing Synchro network. TOC staff used to be able to complete six intersections of retiming per month and keep the Synchro network updated, but this has not been accomplished in recent years due to staff availability. The last major signal retiming project was completed in 2012. It is typical for other towns and cities of size similar to Gilbert to adopt a 3-year timing program, but the Town of Gilbert does not currently have such a program in place.

The Town has a traffic signal warrant summary process established, but it is not formally adopted as a policy. The only formal traffic engineering policy in the Town is a speed hump policy. Approval of traffic engineering activities is currently with the Town Engineer and formal policies should be adopted through the Town Council.

4.3 Data Collection and Use

Other data that the TOC uses includes ARID device data (travel times) collected by Town-owned ARID devices and historical Inrix data (speeds and travel delay) provided by ADOT's statewide master contract with Inrix to all public agencies. Information collected from this data may sometimes be skewed, particularly in areas like the Heritage District where speeds are regularly showing as 'red' because they are reduced to 25mph through the downtown area. There is minimal regular data currently being collected for trails or pedestrian pathways to determine active transportation usage.

Typically, the Town has installed detection systems capable of collecting traffic data (i.e. volumes, speeds, turning movements, lane usage, etc.) that can support real-time and future decision making related to transportation operations and future investments in the transportation system by the Town and the larger region. While the detection equipment is continuing to be installed, it is not being fully utilized as of yet. The TOC is actively working on a plan to expand signal performance metric type data at all signalized locations to help the TOC make better decisions and more timely decisions. Ideally, the data and associated logic to support decision making will be integrated into the ATMS and become more automated in the future.

5. TSMO Staffing

Beyond the organizational units with lead responsibility for TSMO activities, embedding TSMO as a key priority within an agency will typically require integration of TSMO into other Town functions, plans, and programs to support optimized system performance.

Currently, the staffing to support TSMO activities is held within numerous Town departments. Staffing to support a TSMO program was evaluated, including current resources dedicated to management, planning, design, operations, and maintenance of the ITS program.

5.1 Management

The management function is overseeing the TSMO Program as a whole, whether held within one department or separated between multiple departments. Management is in charge of working with other TSMO function staff in implementing the TSMO vision and mission.

The current roles supporting this TSMO function are:

- Deputy Town Management is split into 3 positions, with one overseeing the police department, parks and recreation, and the public works department.
- The Town Engineer oversees Traffic Engineering staff as part of Engineering Department.
- Traffic Engineering staff is comprised of the Town Traffic Engineer and the Assistant Town Traffic Engineer as well as a Traffic Engineering Specialist Senior and Traffic Safety Specialist.
- The ITS Engineer oversees the TOC comprised of ITS Analysts and ITS Specialists.
- All staff in the Town, regardless of department, have an annual performance review process facilitated by Management to give staff an opportunity to improve over time with measurable and clear goals.

5.2 Planning/Programming/Funding

TSMO thinking and TSMO strategies should permeate all relevant planning documents, including plans related to transportation (vehicular and multi-modal), data plans, telecommunications plans, and safety plans. The strategic objectives of the TSMO program plan should also be integrated into any subsequent corridor plans, sub-area planning, investment and funding decisions undertaken by the Town.

The current roles supporting this TSMO function are:

- The Town Staff provides recommendations for projects and programs to the Traffic Engineer. The Traffic Engineer then combines these requests within the Public Works Department request for projects and programs.

- The Transportation Planning group involved in active and alternative mode transportation is under Development Services Department.
- There are a number of opportunities that the Town has pursued for grants. Past grants pursued include MAG Safety, MAG Design Assistance, and MAG TIP projects. The Town is aligning with "What Works Cities" and "Smart Cities" conversations around the country. Public Works and Transportation Planning both have representatives that have pursued grant opportunities, although the Town has relied on the individuals involved to be aware of grant programs rather than a formal process to stay apprised of them.
- There is a well-established IT lifecycle replacement program in place for IT equipment replacement needs, such as monitors, switches, servers, etc.

5.3 Project Development/Design

TSMO needs to be considered at the project level as part of both project design and project scoping.

The current roles supporting this TSMO function are:

- ITS Engineer and ITS Analysts provide plan review for projects that are sent by CIP, Streets, or Development Services for review and redlines.
- Some Departments are included in design review processes, although not all, and not consistently. Responsibilities for projects involving specific types of Town assets are not documented.
- The CIP Program is facilitated by a group of Project Managers that carry out construction implementation of the Town's CIP projects using either the traditional Design-Bid-Build process, or an Alternative Project Delivery Method. Gilbert has traditionally chosen to implement Construction Manager At-Risk (for streets, water, and wastewater, fire stations and other municipal building construction) and Job Order Contracting (for traffic signals) for the design and construction of improvements.

5.4 Operations

The Operations function of a TSMO Program provides the day-to-day and real-time support for the transportation network.

The current roles supporting this TSMO function are:

- Traffic Operations: The TOC was originally under the Streets department and was moved to Engineering to align with ITS equipment being related to Engineering work. There are currently four staff at the TOC, and two additional positions approved and not yet filled.
    - Two ITS analysts whose current job descriptions are to provide business hour coverage for the TOC but also serving as permits/inspections/plan review/maintenance for CIP and Development projects.
    - One ITS Specialist focused on the Town's fiber network that whose position was determined a need for based on number of switches per person.
    - There is an additional ITS Specialist position that has been approved.
    - One ITS Network Engineer position has been approved.
- Traveler Information: Many of the Departments have their own Public Information Officer that is contacted any time the public needs to be informed. There are dedicated Public Information Officers

(PIO) for Parks and Recreation, Police, Economic Development, and Streets. For Streets, the PIO utilizes a 3-1-1 system, Facebook, and neighborhood apps. Public Works (which oversees Streets, Engineering, and the TOC) utilizes the Townwide PIO with Digital Government.

- Data and Communications: IT has added ten FTEs in last two years with more being hired. IT staff is embedded in Fire, Police, Public Works, and Development Services and is coordinated via a rotation program. There is currently no IT liaison for the TOC or Engineering within Public Works. The Geographic Information System (GIS) team, housed within IT, is utilized for location mapping of various assets around the Town.
- Emergency Services: Police and Fire serve as first responders to events that impact transportation operations in the Town. Both Police and Fire staff have access to the intersection cameras to support incident response and monitoring of situations that are relevant to public safety. When a roadway is restricted, Police currently assume the responsibility for traffic management at or near the restriction, including at intersections. For planned restrictions, such as roadwork or a special event, Police will coordinate with Traffic Engineering to plan for traffic management strategies, but the Police currently have authority to override any pre-planned traffic signal strategies.
- Construction: The process from plan review through construction and inspection for completion is one that is covered by Engineering, Streets, and Development Services. There are field personnel (Signal Technicians, ITS Specialists, and TTC/Signing/Striping/Engineering Inspectors) that are required to serve the inspection role for traffic on different types of projects (CIP or Development Services).

5.5 Maintenance

TSMO needs to consider how its assets (including ITS equipment, transportation management systems, the TOC, etc.) are maintained and replaced over their lifecycle.

The current roles supporting this TSMO function are:

- There are currently seven Streets Signal Technicians that serve to maintain existing infrastructure. There is a threshold established of 30-35 signals per Full-Time Equivalent of Streets signal technicians that is held to make sure staffing is commensurate with assets.
- ITS Analysts and ITS Specialist (both from the TOC) provide maintenance services for ITS equipment both for the traffic signals and for real-time operations.
- ITS Specialist is responsible for maintenance and operation of transportation fiber communications and associated equipment
- Town IT staff are responsible for the maintenance end lifecycle of TOC equipment (screens, monitors, switches, firewalls)

Figure 10 shows the Town's current staff organization (across different departments) that are relevant to TSMO activities.

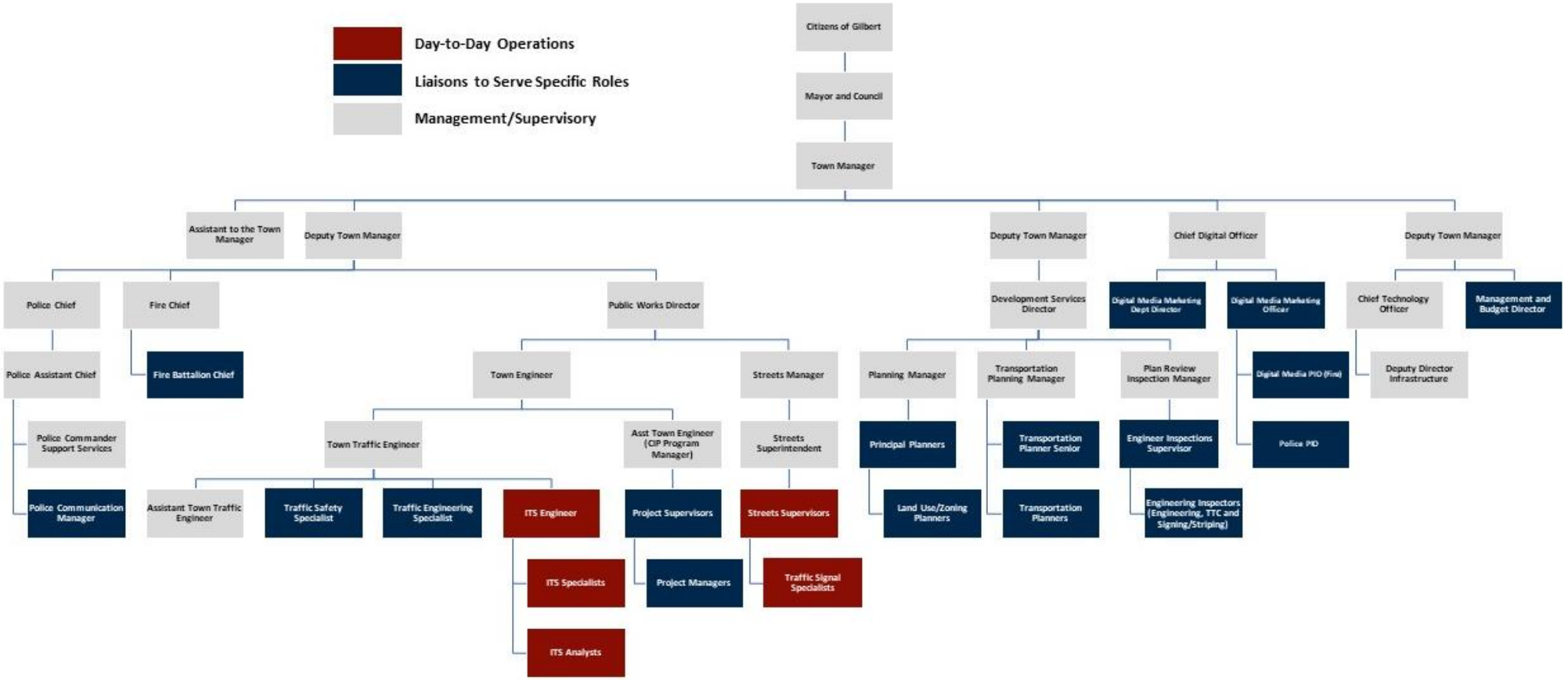


Figure 10: Current Staff Organization Involved in TSMO Activities

6. Existing Processes

The Town has rapidly expanded in the last decade in geographical size, population, and infrastructure, including roadways and associated technologies. The Town's staff numbers have also expanded, but not at the magnitude of the infrastructure they are responsible for, so staff have done their best to most effectively and efficient leverage existing resources and have put efficient processes in place. There is a desire to keep the small-town feel, which is a value system the Town holds central to providing public service, while also being a future-thinking Town and the leading edge of innovation and progress.

This section will summarize current Town processes as they relate to transportation operations and the ITS network. This will include how different organizations interact with each other, how data is used, what external communications occur regarding transportation operations and transportation technologies, how operations are funded, and how maintenance, inspections, and events are dealt with.

6.1 Budgeting and Funding

The Town's budget is a zero-based every three years. With the zero-based budget, justification for funds is needed every three years and that justification is compared to the other needs of the Town. Each Department has somewhere between 10- 20 categories within their budgets depending on how they set it up.

TOC budget is funded through the Highway User Revenue Fund out of Streets and is created and approved by the Town's Traffic Engineer. The two largest budgeting categories for both the TOC and Engineering are Other Professionals (hiring consultants) and Infrastructure Supplies (purchase of fiber and other equipment). The budget is a lump sum amount and can be flexed within the budget categories. There is an operations and maintenance budget that exists within Engineering to support TOC functions. There are currently two Engineering positions that are funded from the Streets budget.

The procurement and installation of ITS equipment at traffic signals are funded by Streets, while other ITS equipment is funded by Engineering. Traffic signals are also funded from the Streets budget through the Highway User Revenue Fund.

Extra fiber is purchased with extra budgets that were allocated to the TOC at the end of each year, which has created a sustainable stockpile of assets to use for maintenance and replacement purposes.

There is no established asset lifecycle or replacement program in place for ITS equipment. There is a well-established IT lifecycle replacement program in place for IT equipment replacement needs, such as monitors, switches, servers, etc.

The Streets budget is built on how many devices and traffic signals there are in the Town to maintain. The budget for maintenance of any new traffic signals that are constructed as part of a project is added in during the Engineering of the project development process using historical information (such as how much budget was used last time that asset was installed and how much was accomplished with that budget).

6.2 Inter-Departmental Collaboration

Construction activities are largely managed and coordinated independently by CIP and Development Services. Roadway design standards need to be updated to accommodate active transportation considerations for all Departments to utilize when constructing projects. Plan reviews are managed by CIP process for CIP projects and by Development Services for development projects. For ITS and fiber components of CIP or development

projects, plan reviews are conducted by TOC staff. Third party Construction Managers are typically in charge of CIP project design processes and decide which Departments to involve. Engineering is brought into CIP and Development Services projects prior to project scoping. Streets is invited to larger projects during the up-front design and construction process. New Town infrastructure is constructed/implemented by ITS Analysts/Traffic Signal Technicians and then is handed over to Streets to maintain.

There was an existing GIS map that the Town utilized that showed active construction, but this map has not been updated in many years (https://www.gilbertaz.gov/residents/living-in-gilbert/area-maps/interactive-maps). The Town is currently in discussion to provide an active construction map.

IT to support systems, equipment, and firewall access at the TOC in conjunction with the TOC. There is a good working relationship between the departments and an understanding of roles and responsibilities. IT will provide the equipment and give access to the TOC and then support the equipment for TOC use. The TOC servers are backed up once per week and are able to be accessed upon TOC request. The TOC and IT are partners in the management of the Town's fiber network – the TOC is responsible for all outside plant fiber external to a Town facility and in the roadway, while IT is responsible for internal fiber inside of facilities that create campus-to-campus connections.

A number of collaboration meetings occur in the Town that offer opportunities to educate and share lessons learned or knowledge as related to TSMO activities, including:

- Monthly meetings between the Executive leads from each Department, the Second-In-Command from each Department, and Supervisors within each Department that meet together to make sure there's Townwide awareness of issues and concerns as well as cross-Departmental collaboration on important activities.
- Occasional meetings occur between Engineering, Police and Fire.
- Weekly staff meetings for TOC staff that Traffic is invited to join.
- Weekly staffing meetings within Traffic Engineering where the TOC is invited to join.
- Monthly meetings held by Public Works that Traffic Engineering and the TOC are invited to attend.
- Monthly meetings between the TOC and Streets Signal Technicians where they discuss ongoing projects and current issues at specific intersections.
- On occasion, the CIP group will hold a special traffic signal meeting with TOC staff to discuss modifications to traffic signals as well as plans for new ones.
- Weekly meeting every Tuesday held by Transportation Planning which includes requests for information and presentations from other Departments as well as attendance to help inform planning activities.
- All other coordination occurs on an ad-hoc and as-needed basis, such as meetings between the TOC and IT that occur, when necessary.

6.3 Regional Collaboration

The TOC has a good relationship with the neighboring cities and their corresponding TOC/TMC's. They are able to share video feeds through the RCN. The City of Chandler has requested to use the Town's EOC in the past. There is currently limited coordination between the Town and the other cities for construction impacts or emergency response, which results in the Town and other cities having to react to current conditions, rather than proactively planning around known impacts or conditions. The Town sometimes works with adjacent

cities regarding signal timing coordination changes but mostly plan for a break or no coordination at border signals.

6.4 Data

With the Town being data driven and having a desire for being ahead of technology, big data will likely play an important role in the future. This will likely be organized by the IT Department. Data is already being centralized and provided to the public through the Open Data Portal (Alex) system. IT and Digital Government both able to work with Power Bi, Tableau and other data-displaying technologies to help visualize data to create decision-making tools using big data. IT and Digital Government work with individual Departments to help create dashboards of value to their Department design based on the information they need to summarize for access.

While the Town has a lot of technology and methods of collecting or receiving data, much of the data is not currently used or not able to be used. Most of the data available from the TOC systems is not actively used due to lack of staffing resources. The Fire Department has available data and very frequently utilized their data to help make decisions, but the data is usually used in a reactive way, although the Department would like to use it proactively. An additional barrier to using data is a lack of defined roles and responsibilities for the analysis and processing of data. In some cases, the systems that collect or generate the data are managed by IT but are for use by another Department. Often times, it is unclear if it is responsibility of IT or the other Department to collect and process the data.

6.5 External Information Dissemination

The Town's Open Data Portal system (Alex) is used as the public information platform that provides centralized resources and data to answer the public's questions and concerns. As a Townwide platform, the Digital Government team collects data and information from the individual Departments and makes it available to the public. Although a popular tool, all Town Departments are not currently utilizing the tool to its fullest extent. The Alex system has some transportation-related data in the form of public survey results and historical data. The Alex system does not have real-time transportation information available for the public.

The Town has a 3-1-1 web-based system that is used as a citizen reporting phone number to help track and direct citizen service requests, feedback or concerns to the appropriate Departments for resolution. This 3-1-1 system is considered a work order tracking system specifically for citizen feedback. Some Departments utilize the 3-1-1 system for reporting needs seen around the Town, although many times staff will call directly contact the appropriate Department for a specific concern. For concerns related to the TOC or the traffic signal network, 3-1-1 reports are routed to the TOC for response. This can sometimes lead to multiple reports about an issue and make it more challenging to keep track of the reported issue to make sure it is resolved. There currently are no established guidelines for how quickly public feedback is responded to.

Digital Government is a primary source of getting information out to the public. When Digital Government sees comments on social media that need to be addressed, they forward them onto the appropriate group for resolution. For specific projects that the Town is pursuing, project managers at the Town will usually not get Digital Government involved unless they know the project will result in public impacts or will generate public feedback or complaints, such as restricting lanes.

6.6 Planned and Unplanned Events

Work Zones

Information on real-time conditions of planned roadwork is not available to Town staff or the public. Staff receive regular notifications via email about planned restrictions, but there is not a process in place to notify Departments such as Fire and Police if restrictions are changed or removed.

During work zones, if a signal is being turned off, Engineering Inspectors (part of the Development Services) notifies the Contractor to coordinate with the Town's contracted barricade company to submit Traffic Control Plans (TCPs) to Engineering. Engineering makes sure to review the work zone as it relates to the larger street network. On all TCPs, the ITS Engineer's cell phone number (as part of the TOC) is listed to contact prior to any barricades being placed. If there are traffic-related challenges in a work zone, the TOC is contacted by email or phone by the barricade company, Town Staff, Contractors, Developers, and sometimes citizens. The TOC, once notified, will identify the issue and develop a plan to address the situation to help traffic flow and ensure safety. The TOC is not involved in the planning/approval for work zones prior to TCPs being finalized for implementation. Based on a TCP, the barricade company is responsible for setting up the work zone, and Streets oversees the process but does not adjust anything that is set up by the barricade company. If there are issues with the traffic control, Streets will engage Engineering or the barricade company to be resolve them.

A barricade company contract is set up for the Town to support restriction and management of vehicular, bicycle, and pedestrian traffic during incidents, work zones, or planned events. Barricades including physical barriers (i.e. cones, fence barriers, or concrete barriers) or portable DMS, as needed. The entire Town utilizes the current contract and coordinates with the barricade company directly as needed.

Development Services and Streets typically call the TOC when inspection of accessibility ramps at intersections and ITS equipment is needed. TOC staff have been involved in programming of new equipment at signals as part of construction process. ITS Analysts perform some higher-level maintenance and inspection on ITS and fiber equipment, but they do not perform complete preventative maintenance activities.

Right-of-way permit group within Development Services manages the permitting system for the Town. The Streets Inspection Supervisor oversees temporary traffic control staff and manages right-of-way (ROW) and utilities.

Engineering Inspectors used to be managed by the Town Engineer but are now within the Development Services Department included within the same role that covers temporary traffic control and signing/striping inspections. Traffic Engineering used to be responsible for closure requests but now Engineering Inspectors are responsible. Engineering Inspectors are constantly in contact with CIP, especially during projects as engineering, temporary traffic control, and signing/striping is inspected. For signing/striping needs not related to a specific CIP or development project, Streets hires out a third-party service contracted on an annual basis. Engineering Inspectors, though the 'owners' of real-time construction information, do not have access to Town or regional systems that would allow them to get work zone information in the 511 system. They have had issues with some software not operating on iPads and inspection software not working on laptops. This makes it difficult to do plan reviews on their iPads when out in the field.

Though there is good internal coordination during project development, there could be improvements to the process of reporting impacts of construction on businesses to relay to CIP for consideration.

Emergency Response

During traffic incidents, typically Police handle the incident in its entirety including stop-controlling, putting traffic signals in flash, or laying out traffic control. Police do not engage the TOC because there is not consistency TOC staff available to respond to immediate needs for signal timing adjustments. The Town on-call barricade company is called out to put up barricades to block left or right turns away from longer incident management closures (such as fatalities). The Town does not currently have an incident management plan or procedure.

The Fire Department as a primary user of the EVP devices have noticed that the devices do not always function properly at signalized intersections. This means that Fire engine drivers have learned to assume the EVP devices will not work while traveling to and through an intersection. Generally, emergency responders are finding sirens to be less effective due to sound proofing of vehicles, and they could benefit from future connected vehicles or autonomous vehicles alongside EVP. Typically, Police and Fire perform many Traffic Incident Management (TIM) techniques during incident response, even without formal training. When a hard closure is needed for a longer-term and most of the day event, then the intersection may be shut down, but otherwise intersections will be kept open. Police have a budget for a trailer used specifically to support fatality incidents.

There is an agreement in place to provide some Fire Department staff with access to the Town CCTV camera feeds for EOC function, including the ability to control the positioning of the cameras outside of TOC business hours. Fire sees value in the CCTV camera feeds, especially when they are called about emergencies at intersections, because the camera feed will allow them to assess the situation and decide its level or urgency and the types of resources that are required to respond. Staff from Fire have experienced challenges with utilizing the cameras, especially for monitoring security threats, and planned events such as marathons or parades because the existing cameras do not provide full coverage of the roadway network in many of those scenarios. When dispatched to an event, the responding vehicles rely on dispatch and their local knowledge for optimal routing. The fire vehicles do not have integration with google maps or other traffic data that could help them respond more efficiently and safely. They could benefit from real-time data that would allow them to make more informed routing decisions.

While the Town Fire department owns their own mobile data terminal (MDT), they are dispatched by Mesa Fire using the Mesa computer aided dispatch (CAD) system. As the 911 call center, Mesa Fire manages emergency calls first, and then routes the information to the necessary jurisdiction. Fire is the only Town department with access to the Mesa CAD system.

The Fire Department's record management system is called Firehouse. Firehouse is capable of conducting national and state reporting and some prevention efforts, but the system is overall outdated, and the Town is looking to upgrade. They also would like a centralized person to manage the system, which they currently do not have. Once information is received from Mesa CAD, it gets inputted into the Firehouse system. Fire and Police currently don't coordinate during response/dispatch. Police is able to get on Fire response channel to relay information if needed, but there is not a dedicated person to relay information between departments.

There is an existing EOC and there is construction underway for a secondary EOC. The EOC is activated as a multi-disciplinary team where Police will run the Incident Command System model but many other Departments are involved and physically collocate, including IT, Traffic/Engineering, Finance, Logistics Officers, and Digital Government.

Planned Special Events

Parks and Recreation is usually in charge of planned special events, such as parades, festivals, and other events that may result in road closures or restrictions. Parks coordinates with many Town Departments in the planning and organizing of events, including Digital Government, Police, Fire, Streets, Engineering, County, and State, as needed. The TOC will monitor conditions during the Gilbert Days event and have been requested on some other events, although there is not a formal responsibility or involvement for the TOC in event planning and management.

The DMS on Gilbert Road the TOC operates and controls that are used to display public service announcements, to support dissemination of information on road work and incidents in the area and are used for large projects or during holidays near the Santan mall area.

6.7 Streets Maintenance

ITS device maintenance generally occurs reactively, not proactively, and the TOC replaces or maintains CCTV and other ITS equipment as they start to fail. Currently, the TOC cleans the CCTV camera dome lenses and purge the air pressure with nitrogen annually, but there isn't a formal process. The Police Department and EOC has stated that they could benefit from more maintenance to cameras, specifically in regard to cleaning and ensuring constant connectivity. The TOC is in process of gathering data on equipment age to develop a plan for proactive replacement, rather than waiting until failure. The TOC is proactive in making updates to their software and making sure it is up-to-date.

Streets performs the maintenance activities for the Town's transportation assets. Streets is responsible for maintaining everything in traffic signal cabinets, along with EVP devices. Cabinet maintenance that technicians perform is directed by their Streets Supervisor. There are always signal technicians assigned to be on-call for after-hours for signal maintenance calls. There is also a group in Streets that is on-call to respond to any restrictions or hazards in the roadway after-hours (i.e. animal in the road, hazard, sign down).

The Streets staff are responsible for maintenance of traffic signals and other devices mounted to the signals. There is currently a standard in the Streets Department that every traffic signal has preventative maintenance performed six times per year. To maintain this frequency, there is an established threshold for staffing where each Full-Time Equivalent signal technician is responsible for 30-35 signals. This allows staffing to be commensurate with assets. This threshold was established to maintain preventative processes as much as possible, although reactive maintenance activities typically do come up regularly. Technicians have in place SOPs and priorities to follow to determine work activities.

Lucity is used as the main work order tracking system that tracks staff, labor, and equipment. Lucity is a useful tool using a normal sized screen and computer but can be challenging in the field on an iPad or cell phone. Technicians mostly take notes in the field and then enter all information (sometimes 9 to 10 work orders) into Lucity once returning to their office.

6.8 Staff Training

While there are some vendor specific software training available through annual professional organization meetings, the primary training for TOC staff is on-the-job training. There is no formal training, nor standardized training, for managing an ITS Program which is an ongoing challenge with the ITS industry. The TOC is able to complete training through professional organizations and as devices/software dictate being updated on the

latest versions or technologies available. TOC staff is also able to attend regional signal timing trainings for such programs as Synchro offered by MAG and supported by vendors.

Initial training for signal technicians requires shadowing a senior technician and obtaining certification in a variety of continuing education related to signal technician work. Signal technicians receive promotions after years of tenure and are required to obtain a specific number of hours of training each year to stay current on technical capabilities. Vendors sometimes provide training and attendance at statewide conferences can help technicians obtain their continuing education credit requirements. Although training on newer technologies or upgraded versions is regularly available, overall regular training is a desire of Streets staff.

7. Existing References and Documents

A variety of existing documents, processes, and plans that the Town has utilized to guide activities over time have been included in this section. Table 2 identifies those plans and their relevance for this project as they relate to the operations and management of the transportation network and infrastructure were considered.

Table 2: Existing Town Documents Reviewed

Document	Description of Document	Relevance to ITS
2014 Transportation Master Plan	Describes long-term vision and goals for the multi-modal transportation network and identifies recommendations to implement the desired network in the near-, mid-, and long-term.	Transportation improvements including all modes of transportation can have an impact on the signal and fiber network. The fiber section documented specifics about the Towns existing communications infrastructure and provided tools and recommendations for improvements.
2012 Intersection Improvement Master Plan	Evaluated existing and projected demand at major arterial intersections within the Town, and recommended improvements to address level of service and safety.	Understanding any intersections that were recommended for improvement as part of this project will be important for TSMO to update signal equipment and fiber/technology.
2012 Fiber Optic Strategic Plan	Developed a unified strategy for the Town's fiber optic network considering the needs of departments within the Town.	Recommendations made in this plan that have yet to be addressed will be important to carry through and plan for in future developments.
2019 Traffic Counts Map	Map showing annual daily traffic counts at the mid-block of each arterial in both directions.	Corridors with high volumes see more capacity issues and may be candidates for deployment of technology like ARID devices or radar detection to collect specific data.
Town Survey – Citizen Feedback on Transportation in Gilbert	Based on findings from the National Citizen Survey, this included public opinion on mobility, 311 system, and more.	Understanding public perception on transportation and public opinion and desires in what a transportation system should look like can have impacts to how TSMO plans for future technology.
Town Survey – Transportation Poll	Gauged the publics opinion on transportation methods as the Town plans for the future of transportation.	Understanding public perception on transportation and public opinion and desires in what a transportation system should look like can have impacts to how TSMO plans for future technology.
Council Meeting Minutes	Town Council meets and discusses all topics related to business, developments, funding, future vision, and many more topics as it relates to the Town.	As it relates to transportation and ITS, there has been discussion on dockless bikes and their associated benefits and challenges, project budgets, the Town budget, and Town initiatives and investments.
Park Board Meeting Minutes	This group meets and discusses all topics related to Parks and Recreation.	The group discussed updates and expansion of facilities. This would impact the fiber communications network and ensuring that there is connectivity.

Document	Description of Document	Relevance to ITS
Planning Commission Meeting Minutes	This group meets and discusses all topics related to planning efforts.	The group discusses new developments that sometimes need traffic signal studies and modifications or new traffic signals.
Transportation Task Force Meeting Minutes	This group meets and discusses all topics related to transportation within the Town.	This group discusses specifics regarding TOC, traffic signal maintenance budget, street signs, streetlight and signal poles, and overall maintenance budgets. They discuss goals revolving multimodal/active transportation, growth, safety, and technology.
Valley Metro System Map	Shows all routes within the MAG region, including Transit Centers and Park-and-Ride.	There are bus routes and a park-and-ride within the Town limits. Understanding the current transit network can help with consideration of TSMO strategies related to transit.
Valley Metro Arizona Avenue Project	Alternatives Analysis study to evaluate high-capacity transit options in a corridor that would connect downtown Chandler to the high-capacity transit in the Southeast Valley and will identify which type of transit. This will also evaluate potential routes for transit within study area.	Town of Gilbert is in the study area and high-capacity transit can have impacts on the Town's technology needs.
Valley Metro Fiesta District	Alternatives Analysis study to evaluate high-capacity transit options in a corridor that would connect riders from current light rail system on Main Street to areas within the Fiesta District.	Town of Gilbert is in the study area and high-capacity transit can have impacts on the Town's technology needs.
2020 MAG Regional Transportation Plan (RTP)	Multimodal and coordinated regional vision and plan for all modes of transportation investments extending through FY 2040.	Understanding the regional goals and vision for transportation and its growth will impact how the Town chooses to implement their TSMO program and expand technology.
2019 MAG Regional ITS Architecture	This project was to update the current ITS framework to allow for the region to reflect the influence of connected vehicles and integrated transportation services, as well as account for growth by each agency.	Understanding the regional goals and vision for growth will impacts how the Town chooses to implement their TSMO program and expand technology.
2016 MAG Systems Management and Operations (SM&O) Plan	This projects goal was to implement a SM&O Plan that would help the MAG region make smart investments to support essential transportation technology/ITS infrastructure. It also added resources for the operation and management of critical elements of the region's transportation system and help identified priority corridors.	Understanding the regional goals and vision for growth will impacts how the Town chooses to implement their TSMO program and expand technology.

Town support for a TSMO approach is woven throughout the Town's General Plan adopted in 2020, in which there are a number of community goals and associated policies that would support the integration of planning and design with the operations and management of the transportation and mobility system. A large majority of Gilbert residents (81% per the General Plan) are still driving alone when commuting, allowing for a significant mode shift to be supported by a TSMO approach to operating the network that supports all modes.

The community survey completed for the General Plan recognizes that the transportation and mobility system is a critical and highly visible infrastructure element that shapes and connects the Town. As such, congestion ranked highest in terms of issue areas for the Town's transportation. As noted in Figure 11, Congestion occurs in either recurring or non-recurring form and is a main focus of the TSMO approach to the Town's transportation operations.

Figure 11: Community Survey Response of Most Important Transportation Issue

The Town Engineering group has internal documents regarding policies, standards, guidelines, and procedures that they utilize to achieve their goals. Engineering does not have official procedures and guidelines in place, with the exception of the one policy regarding speed humps.

Table 3 below summarizes all the TSMO related documents that were found.

Table 3: Existing Town Engineering Documents

Document	Policy	Standards	Guidelines/ Procedures	Comments
Block Party			X	
Construction Moratorium			X	
Emergency Road Closure			X	
Neighborhood Traffic Management Procedures			X	
Equipment Standards		X		Not accessible online
Flashing Yellow Arrow Implementation			X	
Fiber Special Provisions		X		Not accessible online
Speed Hump	X			
Speed Limits			X	
Stop Bar Installation (Draft version available)			X	Not accessible online
Traffic Counts			X	
Traffic Engineering Permits and Special Events			X	
Improvements Priority System (Draft version available)			X	Not accessible online

8. Programmed Infrastructure and Systems

MAG's TIP and the Town's CIP were utilized to determine the programmed infrastructure and systems in the Town that could be coordinated with to improve Gilbert's TSMO program.

8.1 MAG TIP

The following shown in Table 4 are projects that are programmed in the MAG TIP but not completed that will have an impact on the Town's transportation operations and the Town's ability to manage operations.

Table 4: TSMO Related MAG TIP Projects

Info/Project Name	Project #	Description
TIP - Various Locations	GLB21-060	Replacement of CCTV cameras and upgrade of detection at 63 intersections to Video Detection cameras that provide TMC.
TIP - Guadalupe Rd, Higley Rd, Williams Field Rd	GLB22-119RWZ GLB22-801	Acquisition of right-of-way for intersection improvements Gilbert ATMS Fiber East Ring Project Phase I

8.2 Town of Gilbert CIP

There were a variety of ITS and traffic signal related projects identified in the Town of Gilbert CIP. The major improvements identified are for projects that are programmed but not completed that will have an impact on the Town's transportation operation or their ability to manage them.

There are plans to replace the software systems that Police use for records management and for law enforcement operations. There is also funding for the expansion and reconfiguration of the current police dispatch center and additional funding for the construction of a new Public Safety Training Facility. The Records Management system, and how officers are trained, may affect Traffic Engineering in terms of how crash data collected and reported. Any changes to enforcement training operations may affect how the TOC should react to impacts at traffic signals due to emergency response.

The Town is included in, and funding part of, the TOPAZ Regional Wireless Cooperative (TRWC). This partnership includes the cities of Mesa, Gilbert, and Apache Junction (the East Valley Cooperative) and links the radio systems of multiple jurisdictions to maximize public safety and service-oriented communications and promote interoperability.

The Town is planning three projects – ATMS Phase III, V, and VI, to install new fiber optic cable in the Town. Phase III will install portions of the Val Vista branch line of fiber and connect to the Val Vista and Ray intersection. Phase V will install the east fiber ring and Phase VI will complete the southeast fiber ring. The Town is also planning a Fiber Optic Strategic Build Out project that will generally include design and construction for infrastructure that will complete the build out of the fiber optic network. Additionally, there are plans for a Fiber Optic Communications Infrastructure Replacement project to repair or replace existing conduit, cable, vaults, pull boxes, and additional equipment along 11 miles of arterial streets.

There are plans for a Smart Signal Control System which will include adaptive signal timing system and associated equipment at 26 intersections in the San Tan Village Mall area. There is also funding for the Advanced Detection Safety Improvement project for implementation of advanced detection at intersections that have correctable personal injury crashes and have operational benefit from this equipment.

There is funding for the Intersection Signal Program which includes design and construction of traffic signals at minor intersections, which typically funds two to three signals per year. Currently, there are new traffic signals planned at the following intersections:

1. Recker Road and Somerton Boulevard
2. Recker Road and Galveston Street
3. Williams Field and Wade Drive
4. Williams Field and Somerton Boulevard
5. Riggs Road and Recker Road/Clubhouse Drive
6. Recker Road and Ocotillo Road
7. Higley Road and Coldwater
8. Val Vista Drive and Appleby Road
9. Higley Road and Bridges Boulevard
10. Higley Road and Morrison Ranch Parkway
11. Lindsay Road and Layton Lakes Boulevard
12. American Heroes Way and Gilbert Road
13. Chandler Heights and 180th Street (as part of Chandler Heights Improvement project) (Will be maintained and operated by Queen Creek in the future)
14. Lindsay Road and State Route 202 TI (traffic interchange) (includes new fiber optic infrastructure)

The following are intersections have various traffic signal modifications planned as part of roadway or other intersection improvement projects:

1. Val Vista Drive and Ocotillo Road
2. Val Vista Drive and Chandler Heights Road
3. Recker Road and Warner Road
4. Elliot and Gilbert Intersection
5. Elliot and Cooper Intersection
6. Elliot and Higley Intersection
7. Germann Rd - Gilbert to Val Vista
8. Val Vista Dr Reconstruction
9. Higley and Baseline Intersection Improvements
10. Cooper Road – Encinas to Baseline Imp
11. McQueen/Elliot Intersection Improvements
12. McQueen/Guadalupe Intersection Imp
13. Val Vista/Ray Intersection Imp
14. Power/Queen Creek Intersection Imp
15. Power/Pecos Intersection Improvements

Lastly, there are two planned Townwide projects related to the transportation network. The first is the Turn Lane Safety and Congestion Improvement project that will evaluate intersections that have negative offsets and make improvements. The scope of the project includes potentially reconstructing medians, implementing protected only left-turn signal operations, extending left-turn pocket lengths, adding dedicated right turn lanes, and implementing right-turn overlap signal phasing. This could possibly change left turn operations at traffic signals. The second is the Accessibility Upgrades in Public ROW, which is a multi-year program that will make updates based on the Americans with Disabilities Act (ADA) Transition Plan. This may impact push button poles, placement and operation.

The table can be found in Appendix A that will show individual projects and outline specific details of each project.

8.3 Other Town Activities

The Town is undergoing several projects that will have impacts on the outcome of this plan. The following are the current projects and the review of their impacts to this plan:

1. Fiber Optic Strategic Build-Out (Communication Facilities Implementation Plan)

The purpose of this project is to identify and document the existing fiber optic communication infrastructure, identify the planning costs for upgrading to current Town standards, and identify opportunities for increased bandwidth and expansion of the communications network. It will evaluate all existing communications infrastructure in detail and outline specific plans for updating connections to Town facilities. The results of this project will be critical in the outcomes of this plan and the Town's TSMO vision, as communications is a critical component and backbone of transportation operations and management.

2. Integrated Mobility Master Plan

The purpose of this project is to develop a long-range plan for Town investments and resources to support active transportation and alternative modes including bicycles, pedestrians, shared personal transport, and transit.

3. Streets Long-Range Infrastructure Planning

The Streets Long-Range Infrastructure Planning (LRIP) program is in place to assist departments with evaluating existing infrastructure, understanding needs, and allocating funding towards upgrades along with maintenance staff and time. In fiscal year (FY) 2017, 40% of the Town's traffic signal poles were inspected, and the remainder 60% were inspected in FY18. In 2019, the Town determined future inspection criteria and finalized the LRIP for signal poles. A similar analysis was performed for streetlights, the analysis determined a need for an annual budget specifically for maintenance and replacement of streetlight assets.

Inspection of signal poles can ultimately lead to recommendations for upgrades, which will impact TSMO related functions. Engineering and the TOC will need to be in close coordination in their understanding of what poles are impacted and how to make appropriate changes to the signal and fiber network and related equipment.

4. Broadband Project

Town has a Broadband contract being pursued to procure 5G (Gigabit) connection and Smart City initiatives to support future growth in the community. The goal of this project is to bring fiber to every resident's doorstep. The Town is in the process of releasing an RFP that intends to facilitate the planning, design, and build out of an entire network. The Town would like to eventually own all of the fiber strands and plans to implement a payback model to do so. This would follow the Fiber Optic Strategic Build Out project in terms of build out locations and will consider the business needs as well as Smart City goals. This will include conduit and fiber. The Town is planning on starting with a pilot project in the Heritage District. This project will play an important role with coordinating and connecting to the transportation fiber network and use of equipment.

9. Best Practices

Several best practices have been utilized to aid with this state of practice process. Best practices, particularly in the MAG region for comparable sized agencies in terms of transportation network to manage, were reviewed to determine the Town's overall "state" of managing a TSMO program and the assets involved. Figure 12 through Figure 15 provide a 2017 survey summary completed during the MAG SM&O development of the number of miles of fiber managed, number of CCTV cameras managed,

number of signals centrally managed, and number of infrastructure-related staff to support their ITS programs. These figures provide a context for the amount of infrastructure that the Town manages as compared with their comparable sized agencies.

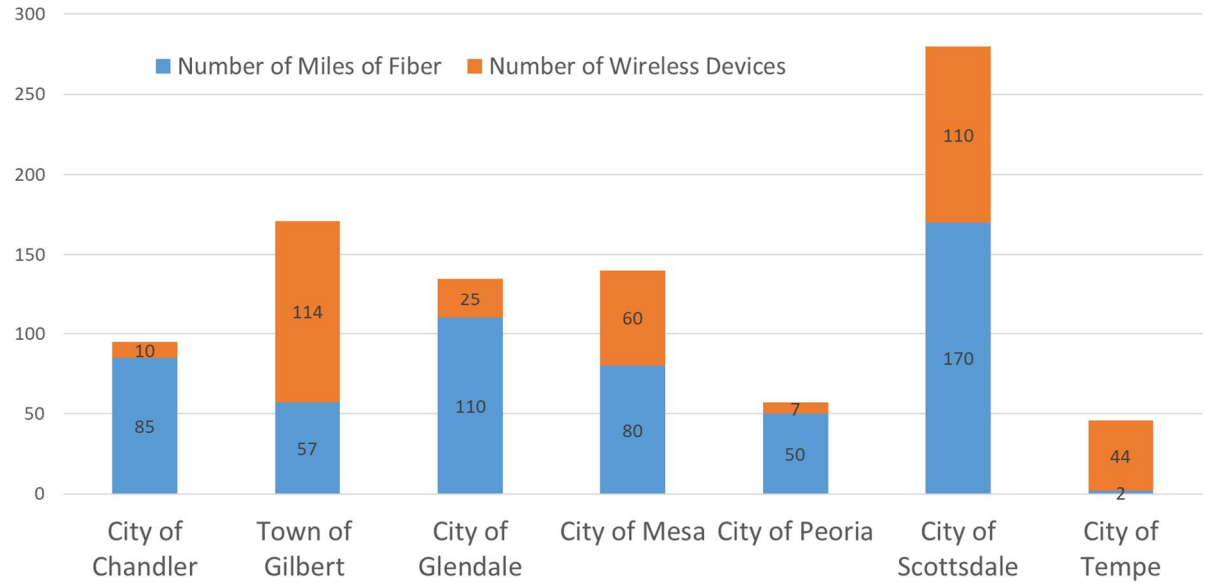


Figure 12: MAG SM&O 2017 Agency Summary – Number of Miles of Fiber Managed

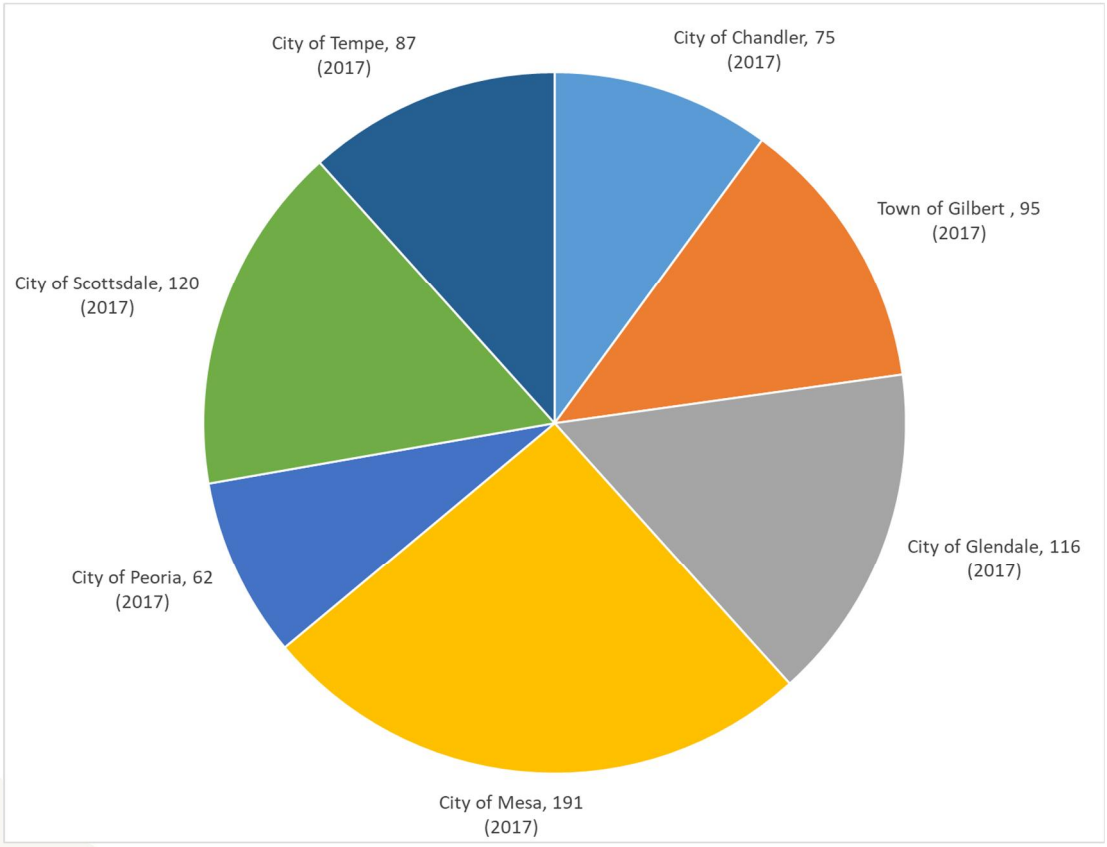


Figure 13: MAG SM&O 2017 Agency Summary – Number of CCTV Cameras Managed

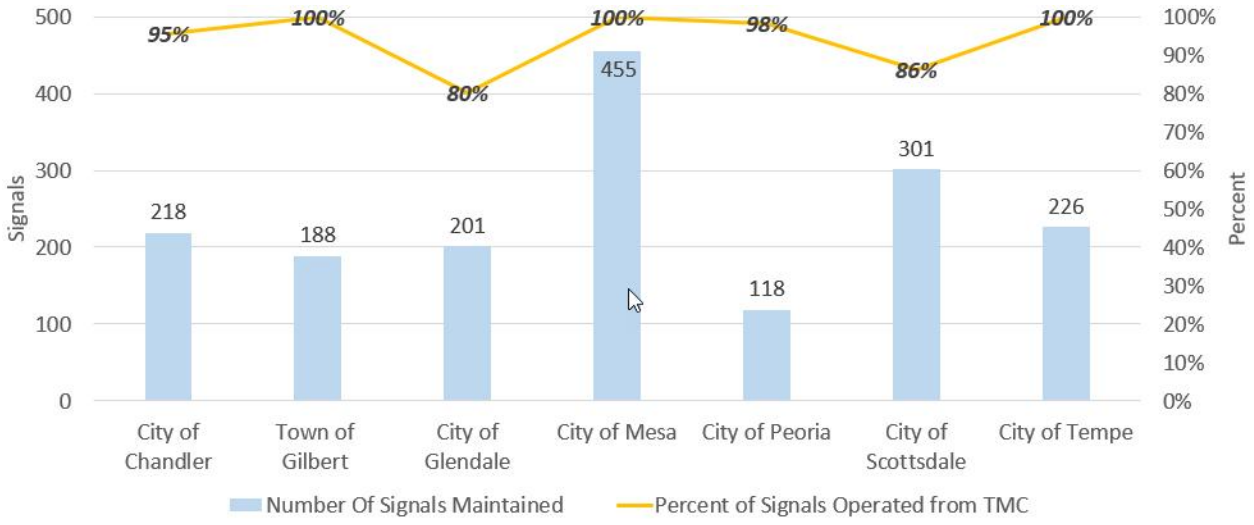


Figure 14: MAG SM&O 2017 Agency Summary – Number of Signals Centrally Managed

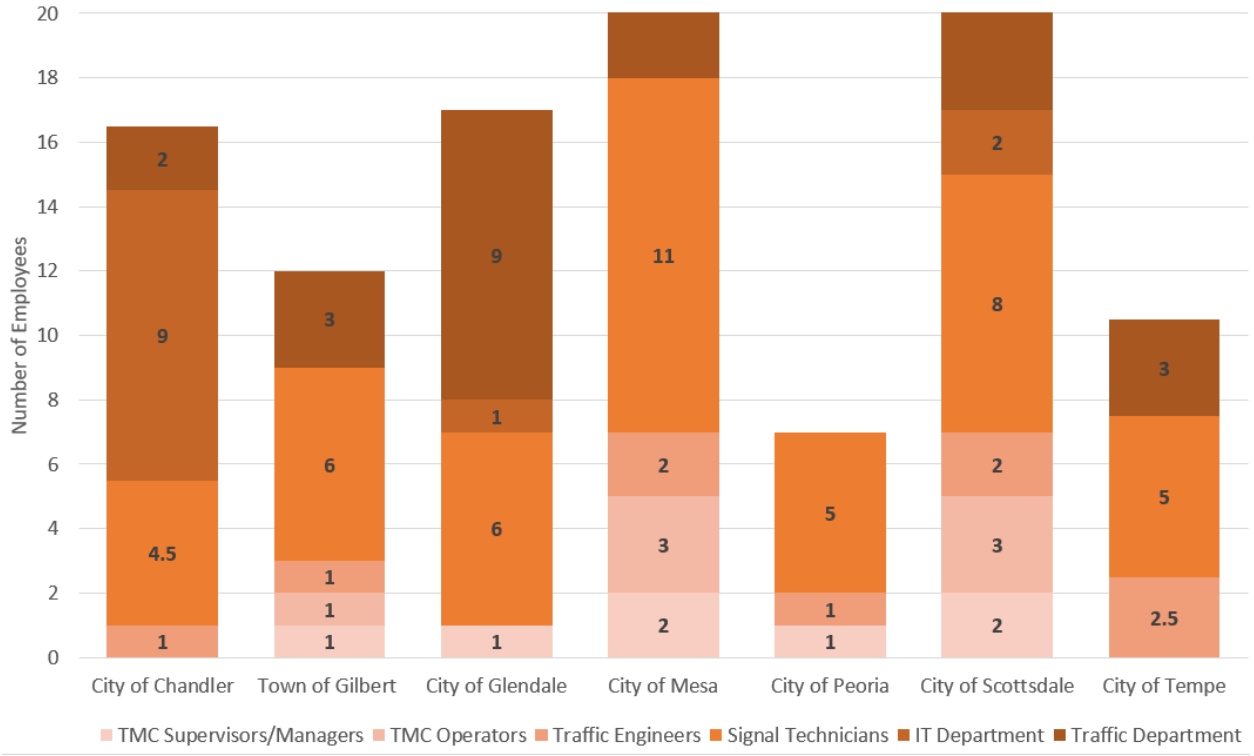


Figure 15: MAG SM&O 2017 Agency Summary – Number of Staff to Support an ITS Program

The importance of this comparison of infrastructure and staffing is to validate that the Town of Gilbert has robust infrastructure and operational capabilities as compared to other agencies that would be considered "well built out". The Town also has done well in terms of connecting infrastructure to their central TOC to be able to manage remotely. In observing the last figure, it is noticeable that the organizational structure of staffing behind supporting an ITS Program is different from agency to agency. Agencies in this region have been reportedly understaffed to support the amount of infrastructure that is maintained, and the skill set needed to maintain it. There are lessons learned that can be taken from how other agencies are supporting their assets in funding, staffing, and infrastructure investments. However,

a TSMO Program for the Town needs to be built within the Town structure and existing staffing capabilities to transition toward a TSMO vision for it to be successful. So while a best practice review of other agencies is helpful to the Town in the development of its TSMO program, it serves an evaluation of current "state" and input toward a direction forward.

10. Capability Maturity Model Assessment

The ability to effectively implement and operate systems, maintain devices, collaborate with regional partners, and influence mobility on key corridors is highly dependent on institutional "readiness" to support and invest in TSMO strategies. Through this TSMO Plan, the Town of Gilbert is looking to improve its institutional capabilities for implementing, operating, and maintaining a safe and effective transportation network, and a CMM assessment closely examines the key dimensions influencing the Town's TSMO readiness.

10.1 CMM Assessment Approach

Research at the national level into the implementation of TSMO by agencies has led to the development of a "Capability Maturity Model". The CMM is a self-evaluation process and identifies critical priority actions that place TSMO activities on a path towards improved outcomes on a continuing basis. The CMM concept was originally developed for the information technology industry and is widely applied in the U.S. and internationally as a means of improving products and services. The TSMO CMM has several key features:

- It contains six key "dimensions" that are necessary for improving program efficiency and effectiveness;
- It utilizes consensus-building to establish baseline evaluations and potential improvements that are incremental and manageable; and
- It prioritizes specific actions that can improve efficiency and effectiveness to the next level.

The six dimensions around which the CMM Assessment is organized include:

- Business Processes: Planning, programming, budgeting, and project development.
- Systems and Technology: Systems engineering, ITS architectures, Concepts of Operations, and technology integration.
- Performance Measurement: Data collection and analysis to support performance measures; performance monitoring and reporting; and integration of performance into operations strategies.
- Culture: Leadership buy-in and support for TSMO and the organization's overall level of TSMO understanding.
- Organization and Workforce: Organizational structure, staff accountability, training availability, and staff resource allocation to support TSMO.
- Collaboration: Level of collaboration within the agency and among partners, as well as established public/private partnerships.

There are four levels of organizational maturity, shown in Figure 16 below. The CMM self-assessment process relies on candid feedback about where the organization currently stands, and what level the organization wants to achieve. Within each level there are specific steps to get to the next level - from

level 1 to 2, level 2 to 3, and level 3 to 4 – and levels cannot be skipped. While not all organizations will have a goal to achieve a level 4 in all dimensions, there may be dimensions where an agency is higher in maturity as compared to others.

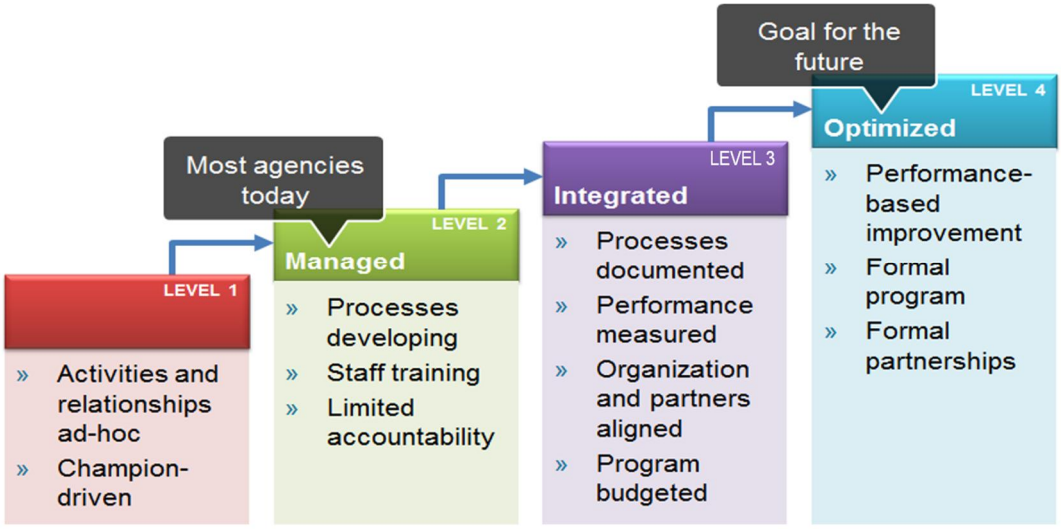


Figure 16: Four Levels of Organizational Maturity

10.2 Gilbert CMM Assessment Workshop Summary and Results

Town staff from multiple departments participated a CMM Self-Assessment to evaluate the current level of "capability" for TSMO in the Town. Groups that were represented in the workshops included:

- Engineering
- TOC
- Streets
- Information Technology
- Development Services
- Digital Government
- Police
- Fire
- CIP
- Transportation Planning
- Finance and Management Services

For each of the six dimensions, a list of strengths and challenges were provided to the Town staff based on prior input from the first two TSMO Plan workshops and the one-on-one and small group interviews. These lists were confirmed or refined during the assessment workshop and provided staff guidance for developing the initial baseline assessment of the Town's current capability (Level 1 through Level 4) within each dimension. Participants then identified key actions that the Town staff should take to build on strengths and address challenges in order to make progress towards the next capability level.

Figure 17 provides a summary of the self-assessment for each of the capability levels.

	Level 1 PERFORMED	Level 2 MANAGED	Level 3 INTEGRATED	Level 4 OPTIMIZED
Business Processes (Planning and Programming)	✓			
Systems and Technology		✓		
Performance Measurement	✓			
Culture	✓			
Organization and Workforce	✓			
Collaboration		✓		

Figure 17: Summary of CMM Assessment Results

Table 5 summarizes the key workshop discussions, including the capability levels and priority actions that were identified. The complete results from the self-assessment exercise is found in Appendix B.

Details related to the Priority Actions and how the Town may go about implementing them - such as project champion, key implementation steps, costs, and other considerations – will be explored in later steps of the TSMO Plan process. Recommendations for policies, people, projects, and processes will be identified in the Deployment and Integration Recommendations effort, and then implementation steps will be detailed as part of the Implementation Plan.

Table 5: Summary of CMM Assessment Results

Dimension	Current Capability Level (Consensus score and definition)	Next Capability Level Definition	Potential Actions to Progress to Next Level
Business Processes (Planning and Programming)	1 *(participants noted some elements fit into level 2)* Each department has its own planning, programming, and budgeting according to individual priorities and capabilities – largely ad hoc.	There is a Town wide understanding of TSMO goals, deficiencies, strategies and common priorities. Processes have been developed to identify and address issues by champion department.	• Investigate opportunities to share and coordinate TSMO needs across departments and ensure deficiencies/priorities are coordinated into long-term planning and programming steps • Encourage documentation of the process and criteria used to make decisions on the overall Town budget and consider ways that TSMO budgeting requests can be standardized and data driven • Currently working on Town specific traffic policies/standards to standardize and support decision making for transportation investments and operations • Establish a formal process for reviewing all projects (CIP, Development, Maintenance, etc.) from a TSMO perspective • Create a more formal program to explore and leverage programming and funding opportunities through regional TSMO programs – ADOT TSMO and MAG SM&O
Systems and Technology	2 *(participant range between 1.5 and 2.5 because of the champion-driven nature of some decisions but, at the same time, there are proactive scoping processes and robust traffic signal and streetlight maintenance program)* Some technology decisions are influenced or guided by a Concept of Operations or higher-level architecture/master plan. Project scoping incorporates technology evaluation, including costs, procurement, and maintenance considerations.	Systems and technology are standardized and integrated on a Town wide/corridor basis through active ITS Architecture and Systems Engineering. New technology includes process updates and training when implemented. Focus on real-time data and traveler information.	• Document and standardize the processes for evaluating and investing in technologies and systems across all departments and share in a centralized location • Create long-term asset replacement plan for transportation technologies (including fiber) and systems (like what Streets has in place for streetlights) to support proactive budgeting for asset replacement and upgrades • Create greater awareness of technology and system resources available in the Town by documenting and mapping technologies and systems that could support TSMO or the transportation network in general • Convene discussions between Town Fire, Police, and TOC staff to discuss EVP challenges, and reach out to other agencies to see what lessons learned the Town might leverage

Dimension	Current Capability Level (Consensus score and definition)	Next Capability Level Definition	Potential Actions to Progress to Next Level
Performance Measurement	1 Some TSMO-related outputs measured and reported, but not consistently or formally. Data availability is inconsistent and not fully utilized to support performance monitoring.	Output data (historical) is used to support planning/ programming and lessons learned/after-action debriefs. Data is collected and used to monitor performance objectives and specific performance targets are developed and reported.	• Create an inventory of data that is available from existing TOC and ITS systems, devices, and other TSMO-related sources • Create data task teams as part of data governance and management group (led by IT) – identify what data different departments need and then identify if it is existing or if there is a mutually beneficial way to get it (ex: leverage Police and Fire who can collect more data for incidents, they just need to know that someone else wants it) • Leverage work currently underway (this TSMO Plan, IT data management strategy, project in partnership Johns Hopkins) to create a TSMO/traffic performance measure strategy that identifies metrics that the Town should measure, monitor, and report on both in the short-term (with current devices/systems) and in the long-term
Culture	1.5 *(participant range between 1 and 2.5 noting that widespread interest and participation in TSMO Plan shows growing understanding in the Town)* There is a growing understanding of TSMO and its business case, and multiple departments support TSMO initiatives through finances, staff, and data.	All leadership/senior management supports TSMO business case and educates political decision-makers and public. TSMO is included as an aspect of Town policy and direction.	• Pursue and implement the priority actions identified in the other dimensions to support the Town in making progress towards having TSMO integrated into the day-to-day workings of the Town • In the future, may consider re-defining the capability levels for Culture based on what the Town is looking to achieve for TSMO • Develop a TSMO marketing effort/website that centralizes existing efforts and builds a cohesive "story" for TSMO. Highlight critical projects or events to increase exposure
Organization/ Staffing	1 *(some participants supported 1.5)* TSMO positions are not defined but may be embedded within existing department structure and staffing -- dependent on technical champions. There is no formal training and a career path may not be well defined.	TSMO-specific organizational structure is developed within/among departments with several key positions established. Staff training is provided in an ad-hoc and on-the-job manner	• Explore formal and informal ways to create a 'Transportation Team' – identify all tasks that need to be accomplished for transportation, and clearly delineate roles and responsibilities for those tasks • Revisit and refresh position descriptions and KSAs to make sure that capability remains through staff transitions • Consider a quantifiable staffing formula for operating responsibility of TSMO functions that will fit into Town's staffing projection model – follow Streets model for signal techs which is based on number of traffic signals • Identify critical training requirements for staff that interact with traffic operations (may be outside of the TOC) and that also support cross-training and staff redundancy. Identify resources including external training (IMSA, ATSA, etc.), or internal/on-the-job training

Dimension	Current Capability Level (Consensus score and definition)	Next Capability Level Definition	Potential Actions to Progress to Next Level
Collaboration	2 Project-specific collaboration between departments occurs and there is a willingness to incorporate input and/or make changes, as deemed necessary or appropriate. There are external partnerships for specific activities.	Departmental collaboration related to TSMO is formalized/documented to establish clear roles and responsibilities and points of contact. External partnerships are formalized with agreements.	• Explore ways to improve the reliability and availability of real-time construction information for Town staff – consider opportunities for Digital Government to support this effort • Develop internal processes/agreements relative to coordination and support (i.e. data sharing, signal operations) • Institutionalize (and document) processes for external coordination (i.e. with neighboring or regional agencies) for transportation planning and operations (including emergency response) • Provide regular presentations or updates related to TSMO to management as part of Executive Team meetings, Second-in-Command (2IC) meetings, and Supervisors meetings

APPENDIX 1 – Town CIP Projects Relevant to TSMO Plan

Info/Project Name	Proj #	Description	Relevance to TSMO
Adaptive Response Unit 2 (ARU-2)	MF2160	The addition of engine company and personnel to supplement the south area of Gilbert to meet service needs for the southern response areas.	Coordination with TOC on best routes, traffic management, emergency pre-emption
Adaptive Response Unit 1 (ARU-1)	MF2290	The addition of engine company and personnel to supplement the North area of Gilbert to meet service needs for the northern response areas.	Coordination with TOC on best routes, traffic management, emergency pre-emption
Advanced Traffic Management System Phase V	TS1330	Design and construction of the east fiber ring. Includes approximately four miles of conduit, five miles of fiber optic cable, enclosures and related infrastructure from Higley Road and Vest Avenue to Greenfield Road and Houston Avenue. Add 3.5 miles of conduit and 4.5 miles of fiber for branch lines along Ray, Warner and Elliot roads.	New fiber installation
Advanced Traffic Management System Phase VI	TS1340	Design and construction to complete the southeast fiber ring. Includes approximately two miles of conduit, five miles of fiber optic cable, enclosures and related infrastructure. Conduit and fiber will be installed on Queen Creek Road between Power Road and Recker Road, on Recker Road between Queen Creek Road and Ocotillo Road, on Ocotillo Road between Recker Road and Higley Road and on Higley Road between Germann Road and Queen Creek Road and between Ocotillo Road and Riggs Road.	New fiber installation
Smart Signal Control System	TS1700	Install an adaptive signal timing system and associated equipment at nine (9) intersections in the San Tan Village Mall area: Williams Field Road at San Tan Village Parkway, Market Street, Loop 202, and Parkcrest; and San Tan Village Parkway at Coronado, Mall Entry, Market Street, Loop 202, and Discovery Park. This project will also include a traffic signal at San Tan Village Parkway and Boston Street.	Updates to traffic signal operations, new traffic signal
Advanced Detection Safety Improvement	TS1740	The project will implement advance detection at intersections that have correctable personal injury crashes and at intersections that will have operational benefit with advance detection.	New detection technology at signals
Fiber Optic Strategic Build Out	TS1940	Design and construction of the fiber optic network throughout the arterial roadways of the Town to complete the infrastructure to necessary for build out. The project consists of conduit, fiber optic cable, enclosures, and related infrastructure and equipment.	New fiber infrastructure

Info/Project Name	Proj #	Description	Relevance to TSMO
Intersection Signal Program	ISP	Design and construction of minor intersection traffic signals at various locations in the community annually, based upon traffic engineering needs analysis.	Program for installation of new traffic signals
Recker and Cooley Loop North	TS1440	Design and installation of a minor arterial traffic signal at the intersection of Recker Road and Cooley Loop North, and connection to the signal system. Includes stamped asphalt crosswalks per Mesa Gateway Airport standards.	New traffic signal
Recker and Cooley Loop South	TS1450	Design and installation of a minor arterial traffic signal at the intersection of Recker Road and Cooley Loop South, and connection to the signal system. Includes stamped asphalt crosswalks per Mesa Gateway Airport standards.	New traffic signal
Williams Field and Cooley Loop West	TS1460	Design and installation of a minor arterial traffic signal at the intersection of Williams Field Road and Cooley Loop West, and connection to the signal system. Includes stamped asphalt crosswalks per Mesa Gateway Airport standards.	New traffic signal
Williams Field and Cooley Loop East	TS1470	Design and installation of a minor arterial traffic signal at the intersection of Williams Field Road and Cooley Loop East, and connection to the signal system. Includes stamped asphalt crosswalks per Mesa Gateway Airport standards.	New traffic signal
Riggs and Recker	TS1500	Design and installation of a major arterial traffic signal at the intersection of Riggs Road and Recker Road/ Clubhouse Drive, and connection to the signal system.	New traffic signal
Val Vista and Ocotillo	TS1540	Design and installation of a major arterial traffic signal at the intersection of Val Vista Drive and Ocotillo Road and connection to the signal system.	New traffic signal
Val Vista and Chandler Heights	TS1550	Design and installation of a major arterial traffic signal at the intersection of Val Vista Drive and Chandler Heights Road and connection to the signal system.	New traffic signal
Recker and Warner	TS1570	Design and installation of a major arterial traffic signal at the intersection of Recker Road and Warner Road, and connection to the signal system. Coordination for this project will occur on the northwest corner with Morrison Ranch development and on northeast corner with the Rockefeller development.	New traffic signal
Recker and Ocotillo	TS1580	Design and installation of an arterial traffic signal at the intersection of Recker Road and Ocotillo Road, and connection to the signal system.	New traffic signal
Higley and Coldwater	TS1620	Construction of a minor arterial traffic signal at the intersection of Higley Road and Coldwater Boulevard, and connection to the signal system.	New traffic signal
Val Vista and Appleby Road	TS1860	Design and construction of a traffic signal at the intersection of Val Vista Drive and Appleby Road and connection to the signal system. Reconstruction of intersection ramps to comply with Public Right-of-Way Accessibility Guidelines (PROWAG).	New traffic signal

Info/Project Name	Proj #	Description	Relevance to TSMO
American Heroes Way/Gilbert Rd Signal	TS1920	Design and installation of a traffic signal at the intersection of American Hero's Way and Gilbert Road and connection into the signal system.	New traffic signal
Chandler Heights Improvements	ST1890	Roadway improvements on Chandler Heights from west of Power Road to Recker Road. Improvements will be half street improvements on the north side of Chandler Heights per Gilbert standards. A new traffic signal will be added at 180th Street.	New traffic signal at 180th Street
Police Records Management Replacement	MF2400	The Gilbert Police Department utilizes a suite of software applications made up of three major components: 1)Computer Aided Dispatch (CAD) used to manage emergency dispatch operations; 2) Mobile for Public Safety (MPS) used to manage mobile communications for patrol cars; and 3) Records Management System (RMS) which is an agency-wide system that provides for the creation, workflow management, storage, retrieval, retention, editing, reviewing and archiving of business information, records, documents, or files related to law enforcement operations.	Emergency response operation changes that could affect signal timing/operations/pre-emption
Topaz Radio	MF2230	The cities of Mesa, Gilbert and Apache Junction have formed an East Valley Cooperative to provide radio support and communications infrastructure for the public safety entities of these cities. This covers our police, fire and public works radio systems. Linking the radio systems of multiple jurisdictions maximizes public safety, promotes interoperability and fosters regional efficiencies which ultimately better serves our citizens. The Topaz website http//www.topazrwc.org/AboutTRWC.aspx provides comprehensive details on the location and scope of this project.	New communications related infrastructure
Police Dispatch Center Expansion	MF2480	This project will provide funding for the expansion and reconfiguration of the current police dispatch center. Additional space and consoles are needed for future workload management. Implementation of these efforts will afford Gilbert residents a significantly more responsive and reliable 911 service, particularly during busy hours (evenings, weekends and major holidays). In addition, the changes will provide a healthier, stress-reducing environment for the 911 call-takers. Physical changes will be added to control noise, provide appropriately sized work areas, and deliver amenities needed for stress management.	Police dispatch overlaps with emergency pre-emption and communications/ITS infrastructure

Info/Project Name	Proj #	Description	Relevance to TSMO
Public Safety Training Facility	MF0400	Project includes the construction (with equipment/furniture) of joint public safety training facility. The project will provide a village style tactical training campus for police and fire, necessary training props and supporting infrastructure as well as drive training components consisting of a tactical driving course, evasive maneuver course and driving skills pad. Additional components include streetscape props for tactical police and fire training scenarios along with conventional structure props, and classrooms. The project will provide critical support for current and long-term training needs necessary for the delivery of quality public safety services as well as support for regional training efforts.	ITS infra could potentially connect to this facility, and would be good to understand plans for police and fire training in regard to traffic ops
Elliot and Gilbert Intersection	ST1320	Improvements being made to reduce congestion include widening to provide additional through, left and/or right turn lanes, and bike lanes as justified by traffic studies conducted as part of the design. Also includes traffic signal and related drainage improvements.	Traffic signal modification
Elliot and Cooper Intersection	ST1380	Intersection improvements at Elliot and Cooper Roads in accordance with the Maricopa Association of Governments (MAG) Regional Transportation Plan approved by voters as Proposition 400 in 2004. Improvements to reduce congestion include widening justified by traffic studies, and related traffic signal and drainage improvements.	Traffic signal modification
Elliot and Higley Intersection	ST1390	Intersection improvements at Elliot and Higley Roads are to reduce congestion include widening to accommodate additional lanes as justified by traffic studies. Also includes a traffic signal and related drainage improvements.	Traffic signal modification
Germann Rd - Gilbert to Val Vista	ST1450	Completion of Germann Road in accordance with the Maricopa Association of Governments (MAG) Regional Transportation Plan approved by voters as Proposition 400 in 2004. Improvements are designed for major arterial roadway standards, including six lanes, a raised median, sidewalks, bike lanes, streetlights, traffic signals, interconnect and improvements to the bridge over the Eastern Canal. This project will complete gaps in Germann Road left between areas previously completed by development. The project will also include Lindsay Road improvements between SR202 and ¼ mile south of Germann Road. Water improvements include connecting zone 1 and zone 2, as well as a 12" water line in Lindsay Rd for future development.	Traffic signal modification

Info/Project Name	Proj #	Description	Relevance to TSMO
Turn Lane Safety and Congestion Improvements	ST1540	Modify intersections that were constructed with a negative offset. Possible scope to include reconstruction of medians and conversion to protected only left-turn signal operation, extend the left-turn pocket length at intersections, add a dedicated right turn lane at intersection to reduce disruption to through traffic caused by drivers making right turns, as a right-turn overlap phase at intersections with heavy right-turning movements to improve traffic operations. Locations will include, but are not limited to Lindsay and Elliot, Val Vista and Warner, Lindsay and Warner, Val Vista and Guadalupe, Lindsay and Ray, Gilbert and Ray, Lindsay and Williams Field, Cooper and Warner, Higley and Queen Creek, and Val Vista and Elliot.	Changes to left turn traffic operations
Accessibility Upgrades in Public ROW	ST1550	This program is a multi-year program and systematically replaces and repairs deficient sidewalk, sidewalk ramps, driveways and pedestrian push buttons. The ADA Transition Plan is used to prioritize locations to be compliant with the current PROWA). PROWAG is a guideline by the US Department of Transportation related to ADA Pedestrian Facilities in the Public Right of Way.	Updates to push button poles/placement/operation
Lindsay Rd/SR 202	ST1580	Construction of a new full access traffic interchange (TI) at Lindsay Road and SR 202 (Santan Freeway) to provide access to SR 202 and a frontage road system on the north side of SR 202 between Lindsay Road and Gilbert Road. The improvements will include the construction of the entry/exit ramps and frontage road, traffic signals and interconnect, improvements to the mainline SR 202 to accommodate the new TI, reconstruction of Lindsay Road between the ramp termini, mitigation or relocation of public and private utilities along the Lindsay Road and Eastern Canal alignments, reconfiguration and mitigation measures for Zanjero Park, purchase of additional right-of-way for the TI, and other minor improvements to the existing street network to accommodate the TI.	New traffic signal at the interchange, ITS connection between the Pecos and Germann project along Lindsay
Val Vista Dr Reconstruction	ST1690	Major reconstruction of deteriorated asphalt pavement on Val Vista Drive from Baseline Road to Guadalupe Road intersection, adding bike lanes, updating landscaping in median and refreshing three signals to current standards. Signals will be upgraded to flashing left arrows.	New signal equipment
Cooper Road – Encinas to Baseline Imp	ST1800	Major reconstruction of deteriorated asphalt pavement on Cooper Road from Encinas Road to Baseline Road. Additional improvements will include minor traffic signal work at Houston Road and the installation of a 12” PVC water line.	Traffic signal modification

Info/Project Name	Proj #	Description	Relevance to TSMO
McQueen/Elliot Intersection Improvements	ST1870	Intersection improvements at McQueen Road and Elliot Road. Improvements will reduce congestion and address safety concerns by adding northbound/southbound right turn lanes and northbound/southbound dual left turn lanes; update traffic signal; ADA enhancements. The SRP well and several 69KV line impacts will also be resolved.	Traffic signal modification
McQueen/Guadalupe Intersection Imp	ST1910	Intersection improvements at McQueen Road and Guadalupe Road. Improvements will reduce congestion and address safety concerns by adding northbound/southbound dual left turn lanes, a third Eastbound/westbound thru lane, eastbound right turn lane, and northbound right turn lane. Traffic signal will be upgraded and ACP water lines and 69kv line impacts will be resolved.	Traffic signal modification
Val Vista/Ray Intersection Imp	ST1920	Intersection improvements at Val Vista Drive and Ray Road. Improvements will reduce congestion and address safety concerns by adding lanes justified by the MAG 2012-2016 High Crash Intersection data. The traffic signal will be upgraded and will comply with PROWAG recommendations. Water scope is the replace existing 12" ACP pipe with a new 12" PVC water line on Ray Road from Val Vista Drive east approximately 900 linear feet.	Traffic signal modification
Power/Queen Creek Intersection Imp	ST1940	Intersection improvements at Power Road and Queen Creek Road. Improvements will reduce congestion and address safety concerns by adding lanes justified by the MAG 2012-2016 High Crash Intersection data. The traffic signal will be upgraded and will comply with PROWAG recommendations.	Traffic signal modification
Power/Pecos Intersection Improvements	ST2000	Intersection improvements at Power Road and Pecos Road. Improvements will reduce congestion and address safety. Project elements will include an assessment to determine need for an at grade separation with the Railroad. Improvements will include adding dual eastbound and westbound left-turn lanes, a 3rd eastbound through lane, dual eastbound and westbound right-turn lanes. These improvements will require the upgrade of the signal system. Water scope includes 700 LF of 12" waterline from Pecos Road north to Power Road.	Traffic signal modification

APPENDIX 2 – CMM Assessment Results

Business Processes: Planning and Programming

Workshop Outputs

Strengths Cited	Challenges Cited

• Some processes in place to involve TSMO staff in project scoping and decision-making
• Long-range infrastructure planning process in place for traffic signals, IT equipment, and other assets
• Strong system in place for processing work orders
• There is visibility in this strategic document for TSMO initiatives in the recently adopted Gilbert General Plan
  o Specifically identifies a policy that supports advanced transportation technologies to promote safety and mobility (see Policy 30, page 78).
  o Manage congestion is also a specific Connectivity Goal.
• Strong relationships between staff that supports TSMO that help processes connect and move forward
• Good job at connecting with residents and using feedback to drive discussions (very resident focused)
• Required to update CIP annually – touch base with every department each year
• Projects are revisited and new staff are brought in before projects are implemented
• Existing processes for pursuing transportation investments are effective and efficient – allow more things to get done (even though they may be siloed)
• Flatness of organization creates flexibility and allows changes to be made quickly
• ITS/Traffic budget requests have been supported and needs are generally met
	• No long-range infrastructure planning process for ITS devices other than traffic signals
	• Budgets to serve TSMO Program are separated out and held within many departments
	  o IT liaisons in each department – for IT issues, it is hard to identify which department is responsible for projects (in terms of budget and priority level)
	  o Budget decisions are made by the Office of Management and Budget but there is not a transparent process for how decisions are made in terms of which budgets gets spent first and who can use the funding
	  o Traffic engineering staff salaries comes out of Streets funds
	• There are no formalized Town traffic policies/procedures to support project development and decision making
	• Development process is organized so plan review is separate from inspection and is handled by different staff (can't coordinate schedules/workload or get input earlier in the process)
	• Planning efforts do not always get used; there is not always a policy directive to use the results of plans
	• Projects or processes related to transportation are developed within silos (silos themselves work great) – not always easy to connect silos, especially when there is staff turnover
	• Need more effective coordination and re-grouping with staff in different departments during project design (this is currently well-executed during programming)
	• Need a single point source to identify where all department needs/strategic vision is captured – each department knows their own vision but maybe not any others (ex: data sharing is a gap that needs to be bridged)
	• Roles and responsibilities sometimes change as staff transitions and changes
	• Need portfolio management across the organization – how to manage and prioritize projects and funding

Capability Evaluation

Level	1 – Performed	2 – Managed	3 – Integrated	4 – Optimized
Description of Level	Each department has its own planning, programming, and budgeting according to individual priorities and capabilities – largely ad hoc.	There is a Town wide understanding of TSMO goals, deficiencies, strategies and common priorities. Processes have been developed to identify and address issues by champion department.	TSMO program is integrated into Town's overall multimodal transportation planning and programming. Processes are documented widely followed, and there is dedicated funding to support the program. Opportunities for external/regional funding are identified and actively pursued.	TSMO is an essential element of Town's multi-departmental plans, programs, and budgets. Processes and programming are routinely adjusted based on performance and asset management evaluations and life-cycle costs.
Consensus Score (1 – 4)	1 (with some elements that fit into 2)			

Workshop Actions to Advance to the Next Level

- Investigate opportunities to share and coordinate TSMO needs across departments and ensure deficiencies/priorities are coordinated into long-term planning and programming steps.
- Encourage documentation of the process and criteria used to make decisions on the overall Town budget and consider ways that TSMO budgeting requests can be standardized and data driven
- Currently working on Town specific traffic policies/standards to standardize and support decision making for transportation investments and operations
- Establish a formal process for reviewing all projects (CIP, Development, Maintenance, etc.) from a TSMO perspective
- Create a more formal program to explore and leverage programming and funding opportunities through regional TSMO programs – ADOT TSMO and MAG SM&O.

Systems and Technology

Workshop Outputs

Strengths Cited	Challenges Cited

• Robust systems and technology used to manage transportation network, including the traffic signal system
• Centralized TOC in place and staff has remote access to manage the system, if needed
• Partnership between TOC and IT allows for procurement of necessary systems and technology
• Sharing camera images with other departments (such as police and fire)
• Proactive maintenance from Streets for traffic signals
• Public-private-partnerships are being explored for multiple purposes to help the Town efficiently address needs/ challenges
• The Fiber Optic Strategic Build Out project will help guide build out of the Town's communication infrastructure
• TOC and Streets work together to provide ITS equipment that allows for a quick setup, maintenance, replacement, and troubleshooting.
• Working on a project intake process for IT – help engage stakeholders and achieve better outcomes (IT is a partner)
• Technology decisions all have a business purpose, are often justified by data (wherever possible), are made to improve services for residents and employees in the Town
• Staff participate in regional groups that are doing technology planning – can help Town make decisions and makes Town a regional partner
• Good documentation (continually getting better) on TOC/ITS technologies and system – why we have it/how we got there)
• IT knowledge base documentation (service catalogue) available to customers (self-help articles) and IT has good network diagrams
• Town has regional funding to upgrade cameras and detection in the near-term
• IT put in a system to field and track tickets (allows them to track performance related to requests)
	• Lack of standards for how transportation technologies are used for studies, analysis, sharing, etc.
	• Projects related to the TOC are challenging because there is not a clear vision, expectations, or criteria to follow
	• Division of ownership, maintenance responsibility, and budgets for technology infrastructure between Engineering, Streets, and IT makes it challenging to coordinate and make most efficient decisions
	• No centralized location for data aggregation or analysis
	  o Not leveraging existing transportation technologies and data to best support response time and decision making; data not being shared or made available to all potential users
	• Not actively managing asset uptime (such as signals and data collecting devices)
	• No standards for data security or privacy
	• TOC is not 24/7, and may not be staffed during peak hours
	• Technology decision making has been well done on individual group basis, but it is not generally shared among other groups
	  o Need more sharing of lessons learned and resources
	  o Need formal/documented processes in place to evaluate new or potential technologies or systems
	• Systems Engineering process is not regularly followed for TSMO projects
	• Maintenance on ITS equipment is generally reactive
	  o Need governance processes (currently working on it) and service desk standards
	  o Need a long-term plan for infrastructure replacement (ex: fiber)
	• Changes to TOC firewalls and systems can occur without coordination
	• TOC does not have training or role in their firewall & switches (responsibility of IT), which sometimes creates challenges (ex: troubleshooting issues between the Town network and the Traffic/RCN network)
	• IT needs (and is currently working on) service level or experience level agreements to help set expectations for response to issues
	• Uncertainty in technology and policy environment makes it hard to plan for future investments
	  o It is hard to make decisions that support most efficient use the Town dollars if it is constantly changing
	• Lots of things are driven by individuals (and are kept up because of those individuals) – not as good with documentation/ standards/institutional processes
	• EVP in the Town is not effective for emergency services – need better internal coordination and coordination/consistency with external partners (neighboring jurisdictions, Mesa Fire)

Capability Evaluation				
Level	1 – Performed	2 – Managed	3 – Integrated	4 – Optimized
Description of Level	Ad hoc approach to device and technology implementation without consideration of systems engineering and appropriate procurement processes.	Some technology decisions are influenced or guided by a ConOps or higher-level architecture/master plan. Project scoping incorporates technology evaluation, including costs, procurement, and maintenance considerations.	Systems and technology are standardized and integrated on a Town wide/corridor basis through active ITS Architecture and Systems Engineering. New technology includes process updates and training when implemented. Focus on real-time data and traveler information.	System architectures and technology are routinely upgraded to improve performance; systems integration/interoperability is maintained on continuing basis; exploration and implementation of new technology is supported by multiple departments. Life-cycle costing informs future asset management needs with associated budgets to take advantage of regional funds through TIP programming
Consensus Score (1 – 4)	1.5 (lots of things are person-dependent)	2.5 (technology decisions are made with justification, good process in place for scoping and programming)		

Workshop Actions to Advance to the Next Level

- Document and standardize the processes for evaluating and investing in technologies and systems across all departments and share in a centralized location
- Create long-term asset replacement plan for transportation technologies (including fiber) and systems (like what Streets has in place for streetlights) to support proactive budgeting for asset replacement and upgrades
- Create greater awareness of technology and system resources available in the Town by documenting and mapping technologies and systems that could support TSMO or the transportation network in general
- Convene discussions between Town Fire, Police, and TOC staff to discuss EVP challenges, and reach out to other agencies to see what lessons learned the Town might leverage

Performance Measurement

Workshop Outputs

Strengths Cited	Challenges Cited

• Robust traffic data that is available from TOC systems and ITS devices/technologies
• Management has put a big emphasis on making data-driven decisions, and Departments are working hard to identify the data they need to support this process
• Most departments have key performance metrics that help define their missions and progress
  o IT metrics are collected and used to prioritize efforts, but could be shared with other groups/be more transparent
  o Police and Fire are very data driven (almost every decision is based on data)
  ▪ Need to work on sharing crash data with engineering more readily
• Digital Government is centralized 'collector' of data
  o 311 (public service request) – used to inform departments to direct resources
  o Social media metrics
  o Survey residents to help Town make investments/decisions
  o Internal surveying to improve Town processes
  o COVID data to inform decisions
• Records management is a priority of many departments, so there are resources available to support it
  o Fire is getting a new RMS system – presents an opportunity for other departments to get in requests as the system is configured
• The Town has identified the three Wildly Important Goals that can be directly supported by TSMO (ITS is the first initiative listed in the goal of 'Exceptional Built Environment')
• IT is currently leading the development of a data management strategy which will look at data and consider how to correlate and organize it differently (data virtualization)
  o Working on dashboards and have town management support and funding
• Just started a data governance and data management group – will do comprehensive data inventory
  o Data owners for publicly available data is well documented, but the same accountability is needed for internal data
• Do report on corridor performance on a sporadic basis (ex: lagging left study)
• Near-term project from the Town management level in partnership with Johns Hopkins to look at performance measurement
	• Data analysis for traffic is not being performed for the purpose of performance measurement
	  o There are no formalized performance measures for the traffic group (such as performance of signal timing)
	• There is a lot of traffic data that is underutilized and/or not shared with others
	  o Technology is the limitation for taking data and making it accessible to others
	• Data evaluation – need to have people who can accurately read data and make decisions based on it that can be backed up
	  o Need staffing resources to support configuring and utilizing traffic data (ex: lots of opportunity to share traffic data with Development Services if there were staff resources to support aggregation and sharing of this data)
	  o Need more automated tools to support data analyses
	• Need better ways to share data/information with the public
	• Process to collect and follow up on public complaint for transportation is not well documented and changes regularly
	• It is not clear who has the responsibility for collecting, analyzing, or sharing data internally
	  o Need to make data more accessible across the organization – outside of silos
	• Not always gathering the right data – it would be easy to get the data upfront if we knew which data is needed; but it is much harder to get it after the fact
	• No monthly/quarterly tracking of corridor performance

Capability Evaluation

Level	1 – Performed	2 – Managed	3 – Integrated	4 – Optimized
Description of Level	Some TSMO-related outputs measured and reported, but not consistently or formally. Data availability is inconsistent and not fully utilized to support performance monitoring.	Output data (historical) is used to support planning/programming and lessons learned/after-action debriefs. Data is collected and used to monitor performance objectives and specific performance targets are developed and reported.	Outcome data is available by different departments, and performance measures are used to inform investment priorities and decision-making. Dedicated staff are assigned to managing data and performance management.	System-level performance data from multiple departments are centrally managed and displayed on a dashboard. The data is routinely utilized to make continuous program improvements; data is reliable and provided publicly.
Consensus Score (1 – 4)	1 (data is seen as critical, but not well used yet for TSMO)			

Workshop Actions to Advance to the Next Level

- Create an inventory of data that is available from existing TOC and ITS systems, devices, and other TSMO-related sources
- Create data task teams as part of data governance and management group (led by IT) – identify what data different departments need and then identify if it is existing or if there is a mutually beneficial way to get it (ex: leverage Police and Fire who can collect more data for incidents, they just need to know that someone else wants it)
- Leverage work currently underway (this TSMO Plan, IT data management strategy, project in partnership Johns Hopkins) to create a TSMO/traffic performance measure strategy that identifies metrics that the Town should measure, monitor, and report on both in the short-term (with current devices/systems) and in the long-term

Culture

Workshop Outputs

Strengths Cited	Challenges Cited
• Strong passion for doing the right thing for the Town and being the best the Town can be • Town desires to share information with the public – transparency and timeliness are important • Want to use data to support proactive enforcement/response • There is an openness to change at the management level • Unified vision around a "Town of the Future" where the Town is more proactive and systematic in how it does business, o Town has strong culture of innovation • Departments are motivated to use lessons learned and data to consider and implement changes that make support low-cost, incremental improvements	• Need to hone a culture of challenging the norm and striving to make things better, not just settling for something because that is how they have always done it • The Culture of the Town is currently grounded in being lean, which may take away from doing what may be most practical or advantageous • Need better continuity of initiatives/vision when there is turnover in management

Capability Evaluation				
Level	1 – Performed	2 – Managed	3 – Integrated	4 – Optimized
Description of Level	Individual staff champions promote TSMO, but level of support for TSMO varies across departments.	There is a growing understanding of TSMO and its business case, and multiple departments support TSMO initiatives through finances, staff, and data.	All leadership/senior management supports TSMO business case and educates political decision-makers and public. TSMO is included as an aspect of Town policy and direction.	Town's mission identifies TSMO and its potential benefits as part of a formal program. TSMO achieves wide public visibility/understanding and credibility.
Consensus Score (1 – 4)	1.5 (widespread interest and participation in conversations about TSMO, but need to institutionalize to show results)			

Workshop Actions to Advance to the Next Level

- Pursue and implement the priority actions identified in the other dimensions to support the Town in making progress towards having TSMO integrated into the day-to-day workings of the Town
- In the future, may consider re-defining the capability levels for Culture based on what the Town is looking to achieve for TSMO
- Develop a TSMO marketing effort/website that centralizes existing efforts and builds a cohesive "story" for TSMO. Highlight critical projects or events to increase exposure.

Organization and Staffing

Workshop Outputs

Strengths Cited	Challenges Cited

• Town staff collectively have skill sets to serve TSMO purposes in a variety of departments
• Streets has a clear and agreed-upon threshold for hiring traffic signal technicians so that the level of service does not deteriorate
• Department management is open to re-organization of staffing structures
• It is relatively easy to share resources within Public Works, especially if there is staff availability– challenge is that there is not often availability
• There is an initiative to capture peer data on staffing to see what the Town is 'up against' in terms of staffing numbers and capability
• There are data metrics to track where time is being spent to help make decisions on if groups or staff need to reallocate current time or hire more staff
  o IT tracks time and progress as part of incident management system
  o IT track work that cannot get done with existing resources to show capability and set expectations for progress that can be made with existing staff
	• There is not a clearly defined organizational structure for all staff who are responsible for the 'transportation system (there is no 'transportation group')
	  o Ex: Transportation Planning is under Development Services while Traffic is under Engineering
	• Frequent management transitions in transportation groups has created inconsistencies in vision and understanding of responsibilities
	  o Seem to be constantly reinventing the wheel based on current management's priorities and vision
	  o Don't have longevity of positions – need stability to help define roles and responsibilities
	  o People who have been at the Town for a very long time have gotten used to doing certain roles, but their position many not be the best fit for that role
	• TOC/ITS is functioning with the same level of staffing even through amount of infrastructure and the roles are responsible for has increased
	  o TOC staff cannot address all responsibilities in their job descriptions because of the demands of certain responsibilities (such as inspections), the result is that not all TOC functions are being addressed (such as support to emergency services for incident management)
	  o No quantifiable metric to calculate staffing requirements to support TSMO functions
	• Need more staff redundancy in some TSMO positions, including fiber/network management
	• Need to share staff availability more – don't know if someone has availability to help or if they are trained in the aspect you need help in
	• Some job descriptions are so comprehensive and try to fit so many things into a position that it is hard to find qualified candidates and lose strength in a specific area (may need to break jobs up into multiple positions)
	• Career progression is often based on tenure rather than achievement of specific skill sets/milestones
	  o Would be helpful to have a model for continuing education training (like for certifications like PE)
	• Formalized training is needed on TSMO and ITS for both TSMO-specific staff and other staff that can support the TSMO program or utilize the data/devices provided by the TSMO program (need documentation and institutionalization of training programs/expectations)
	  o Training so other departments can best interact and leverage the systems or data available
	  o Consistent training is needed for TOC and signal techs given the joint maintenance responsibilities for ITS field equipment
	  o Current workloads make it hard to find time to "train" but formalizing the process would make training necessary and not and extra or add-on task.
	• Rapid change/evolution of technology makes it hard to stay up to date on training
	• Skills are time sensitive and are lost if not used or provided refresher training.

Capability Evaluation

Level	1 – Performed	2 – Managed	3 – Integrated	4 – Optimized
Description of Level	TSMO positions are not defined but may be embedded within existing department structure and staffing -- dependent on technical champions. There is no formal training and a career path may not be well defined.	TSMO-specific organizational structure is developed within/among departments with several key positions established. Staff training is provided in an ad-hoc and on-the-job manner	TSMO staffing is well defined with dedicated leadership, job specifications, formal training, and career path for core TSMO positions.	TSMO staffing needs are institutionalized and supported from a Town management level. There is a formal approach to adjusting future staffing to ensure proper maintenance and operations of assets.
Consensus Score (1 – 4)	1/1.5			

Workshop Actions to Advance to the Next Level

- Explore formal and informal ways to create a 'Transportation Team' – identify all tasks that need to be accomplished for transportation, and clearly delineate roles and responsibilities for those tasks.
- Revisit and refresh position descriptions and KSAs to make sure that capability remains through staff transitions.
- Consider a quantifiable staffing formula for operating responsibility of TSMO functions that will fit into Town's staffing projection model – follow Streets model for signal techs which is based on number of traffic signals
- Identify critical training requirements for staff that interact with traffic operations (may be outside of the TOC) and that also support cross-training and staff redundancy. Identify resources including external training (IMSA, ATSA, etc.), or internal/on-the-job training

Collaboration

Workshop Outputs

Strengths Cited	Weaknesses Cited

• Partnerships/coordination among departments is generally very good
• Leveraging opportunities for public-private partnerships to achieve visions
• There are existing platforms and processes to provide information to the traveling public that can be leveraged to support inter-departmental collaboration
• Fiber network operations and maintenance is effective because of TOC/IT relationship
• Town wide coordination taking place in Executive Team, Second-In-Command, and Supervisors meetings
• CIP meets quarterly with other agencies in the region (mostly SE valley, MCDOT, ADOT) to share what is going on from the project side
• Due to early conversations that included other partners for some new developments, Fire was able to make some changes to their equipment and processes to accommodate new developments
• Town has some collaboration related to Mesa Gateway Airport from economic perspective
• Regular coordination on operations of and planning for Power Road with Mesa, County, and Queen Creek
• Traffic has good relationships with traffic staff at neighboring jurisdictions
• Gilbert participates in regional collaboration (such as AZTech and MAG) and supports development of regional standards and processes
	• Collaboration related to implementing and sharing data on work zone restrictions is not good
	  o Lack of consistency in informing other departments (TOC, Police, Fire) of construction restrictions
	• TOC is sometimes perceived as 'too busy' to support signal operations in real-time for both incidents and planned closures
	• Regular and consistent coordination between departments to learn their processes and improve the relationship for particular business purposes is lacking
	• Digital Government could be utilized more effectively for transportation purposes – proactive instead of reactive
	• Coordination with adjacent agencies and regional partners could be stronger/more consistent
	  o No documented processes for collaborating with neighboring jurisdictions in terms of traffic
	  o Limited coordination with the County for infrastructure (EVP, street widths, access) and operations (traffic signal operations) within County islands – this causes challenges for emergency operations and generally for traffic operations
	• There is varied success for traffic signal coordination at jurisdictional boundaries –no good mechanism to formalize collaboration – sometimes agencies have different goals/perspectives, which makes optimization challenging
	• Very strong individuals in the Town that make things work, but coordination is not institutionalized

Capability Evaluation

Level	1 – Performed	2 – Managed	3 – Integrated	4 – Optimized
Description of Level	Departmental relationships related to TSMO are on personal basis and not formalized; collaboration between departments is ad-hoc and inconsistent	Project-specific collaboration between departments occurs and there is a willingness to incorporate input and/or make changes, as deemed necessary or appropriate. There are external partnerships for specific activities.	Departmental collaboration related to TSMO is formalized/documented to establish clear roles and responsibilities and points of contact. External partnerships are formalized with agreements.	Business models are institutionalized to support sharing of data and resources between departments. Cross-training occurs between departments for TSMO activities.
Consensus Score (1 – 4)		2		

Workshop Actions to Advance to the Next Level

- Explore ways to improve the reliability and availability of real-time construction information for Town staff – consider opportunities for Digital Government to support this effort
- Develop internal processes/agreements relative to coordination and support (i.e. data sharing, signal operations).
- Institutionalize (and document) processes for external coordination (i.e. with neighboring or regional agencies) for transportation planning and operations (including emergency response)
- Provide regular presentations or updates related to TSMO to management as part of Executive Team meetings, Second-in-Command (2IC) meetings, and Supervisors meetings

Appendix C – TSMO Strategy Details

No.	Category	Strategy	Description/Actions	Deliverable/ Outcome	Considerations	Cost	Timeframe & Updates	Responsible Party
1	Infrastructure	Implement an asset replacement and upgrade program for ITS and communications	Review asset management plan provided in appendix and develop annual budgets accordingly.	Formalized asset replacement program and budget	• Work with Finance to try and get an ITS asset management budget line item as part of annual budgets, rather than having to request it each year. • Surprise and Mesa may be good agencies to reach out to get information.	None except for staff time	Near-term	Lead: Traffic/ TOC Support: Finance
2	Infrastructure	Implement a preventative maintenance program for ITS devices and communications	Review maintenance guidelines provided in appendix and create a maintenance schedule for the field devices and communications equipment. There may be cases where there is a need for a higher-level of maintenance requested for a device or system than identified in the proposed maintenance program, such as for CCTV cameras, where Police and Fire may request more frequent maintenance than can be afforded by current TOC staffing. • Discuss how other departments can support the TOC to provide an elevated level of maintenance that may be desired. • Document any resource-sharing agreements through an MOU or other formal agreement.	Formalized ITS maintenance program Inter-departmental agreements for resource sharing for maintenance, as necessary	• Need adequate staffing levels to accomplish maintenance (Strategies 11 and 12). • Consider training/cross-training with Streets and/or IT staff to support level of maintenance service desired (Strategy 13).	None except for staff time	Near-term Agreements should be revisited as needs or resources of the TOC or other departments change	Lead: TOC Support: IT, Police, Fire
3	Infrastructure	Fill ITS and communications infrastructure gaps	Implement new devices or communications at locations where there may be gaps – see Figure 3.	New devices	• See where infrastructure can be included in a CIP or development project. • Make sure technologies are in line with decisions made related to standards and requirements for equipment (Strategy 6). • Make sure to include new technologies or systems into preventative maintenance and asset replacement programs (Strategies 1 and 2).	$389,800 and $300,000 (see Section 3.3)	Varies	Lead: Traffic/ TOC Support: IT
4	Infrastructure, Processes	Identify and document infrastructure standards and requirements to use when vetting technologies and systems so they support multiple department needs	1. Convene all Town departments who utilize devices, systems, or data from transportation (IT, Traffic, Police, Fire, Economic Development, Engineering, Streets, Development Services) to discuss all of the functions and data that they would like to have for the transportation system. 2. Based on the input, develop an approved product list or a set of requirements that all new devices or systems for transportation that are being purchased or evaluated must meet. 3. Develop a process or form that must be filled out during procurement to show that devices or systems meet the requirements.	Document or spreadsheet of standards or APL Meetings between departments	• IT may be the logical gatekeeper of all systems in the Town. They have recently developed a roadmap for how they will navigate and prioritize different system and technology projects at the Enterprise level. A similar process should be done for transportation-specific technologies and systems. A key aspect is going through a privacy and security review for all new systems. • IT is also leading a data governance team that can be leveraged. Requirements for devices and systems can be derived based on the data (type and format) that the Town staff says they need. • This should include input from Police and Fire who both use systems that could support TSMO data and operations and who both could benefit from other traffic-related infrastructure and systems (see Strategy 6 related to camera sharing).	None except for staff time	Near-term Should be updated as new technologies and systems become available	Lead: Traffic/ TOC and IT Support: Police, Fire, Digital Government, and other departments to provide input

No.	Category	Strategy	Description/Actions	Deliverable/ Outcome	Considerations	Cost	Timeframe & Updates	Responsible Party
5	Infrastructure, Processes	Implement CIP and project scoping processes that gather broad TSMO input and account for technology costs and ongoing O&M	• Update project development and scoping processes to gather broader input from Town departments that may not currently be involved. • Update project scoping process to make sure that costs for both the procurement and ongoing operations and maintenance of ITS devices and communications are accounted for in the budget.	Updated project scoping processes	• Need to provide TOC, Economic Development, and Digital Government with the opportunity to participate in the project scoping process. • Ongoing O&M costs are found in costs for preventive maintenance and asset replacement programs (Strategy 2 and 3). • The long-term costs of signals are already included in scoping-level costs and should be updated to include O&M of ITS and communications devices as well.	None except for staff time	Near-term	Lead: CIP and Development Services Support: Traffic/TOC, Digital Government, Economic Development
6	Infrastructure, Processes	Develop and formalize SOPs for traffic management device/ infrastructure and system operations	Develop SOPs for using TOC devices and systems and distribute to all people who have responsibilities for operating or managing the equipment (based on updated org chart). This should include multi-departmental SOPs for sharing of device or system access, including fiber sharing and sharing of CCTV cameras or providing access to data collected by central systems. This should also include discussions with Police about archiving of video.	Set of SOP documents or a manual Meetings between departments	• One output could be a TOC operator manual. • Considering developing agreements or MOUs between departments activities like camera sharing and fiber sharing that include SOPs as an attachment. • Camera sharing discussions should include Digital Government, who may find value in data/images from traffic devices and systems.	None except for staff time	Near-term Update SOPs when new devices are installed, or new agreements are developed	Lead: TOC Support: Police, Fire, IT, Digital Government
7	Processes	Implement Town traffic engineering and transportation operations standards	Propose Town-specific traffic engineering and transportation standards, including signal warrants, traffic studies, and design guidelines. Vet the standards with appropriate staff and confirm the need for any policies or actions from Council to support the standards.	Document of traffic standards and supportive policies	• This is already in progress by Traffic Engineering but needs to be completed and formalized. • An annual Traffic Signal Optimization Program (TSOP) or other recurring operational functions may require dedicated staff/funding. Regional funds are available to supplement and augment Town resources.	None except for staff time	In progress Should be reviewed annually, and updates made as necessary	Lead: Traffic
8	Processes, People	Institutionalize (and document) processes for external coordination (i.e. with neighboring or regional agencies) for transportation planning and operations (including emergency response)	Document current conditions and understanding of processes at jurisdictional boundaries related to: • Signal ownership • Signal timing • Design standards for roadways/intersections • Incident response • Traffic data sharing For each category, identify current challenges or areas for improvement and coordinate meetings with relevant agencies to review processes, identify improvements, and document agreed-upon processes through an IGA/MOU or other form of agreement.	Document Inter-agency meetings and written agreements	• Traffic operations, including signal timing coordination and EVP, at jurisdictional boundaries may be working well, but that may be due to individual relationships and may not be institutionalized. • Emergency services has noted challenges when responding to events in County islands due to substandard roadway widths. • Consider data sharing needs for traveler information through RADS and AZ511.	None except for staff time	Near-term Agreements should be reviewed annually, and updates made as necessary	Lead: Traffic and TOC Support: Fire, Police, Development Services

No.	Category	Strategy	Description/Actions	Deliverable/ Outcome	Considerations	Cost	Timeframe & Updates	Responsible Party
9	Processes, People	Expand the plan review process, including traffic control plans, to include input from all Town departments at the 30% design stage	Update processes for plan review, including traffic control plans, to gather input from a broader set of Town departments at the 30% design level.	Updated plan review and approval processes	Need to provide the TOC, Economic Development, and Digital Government with the opportunity to participate in the plan review process prior to approving plans for construction.	None except for staff time	Near-term	Lead: Town Engineer Support: Traffic/TOC, Digital Gvt, Econ Devel, other interested departments
10	Processes, People	Develop and formalize SOPs for incident response and management and other traffic management processes	Develop multi-departmental SOPs for incident response and traffic management during work zones, special events, and planned roadwork. • Consider having staff who support traffic management (police, fire, TOC, maintenance related to barricades) attend the 4-hour TIM Training course. • Convene working sessions with all staff related to traffic management to discuss roles and responsibilities for incident response in the Town. This should include participation by Police, Fire, TOC staff, Digital Government, and maintenance staff who support traffic control/ barricading. • Develop SOPs and formalize roles and responsibilities for how to most efficiently and safely respond to incidents in the Town, including disseminating information to the public.	Staff attendance at regional TIM Training course Document with SOPs for incident response in the Town May consider formalizing SOPs through operational agreements or MOUs	• Principles behind incident-specific SOPs should be applied to traffic management during planned events, including special events and work zones. • The 4-hour TIM Training course is free of charge and open to all agency first responders, including fire, police, traffic/transportation, maintenance, and towing companies – more information and registration is found here - https://tim.az.gov/node/4653. • SOPs for incident response and management should reflect information from TIM Training course. • SOPs should include processes related to identifying incidents, notifying all responders, actual response processes, notifying the public and other agencies, and processes to close-out an incident and return to normal conditions. • SOPs should be formally accepted by all departments. • Consider implementing a process for formal after-action debriefs to discuss what worked well, what challenges were faced, and where SOPs might need to be updated.	None except for staff time	Near-term TIM Training is one-time course SOPs and any resulting operational agreements may be updated based on findings of after-action debriefs	Lead: Traffic/ TOC, Police, Fire Support: Digital Government
11	People	Organize and clarify staffing roles and responsibilities to make sure there are staff identified and available to perform all TSMO functions	Review the recommended and revised Public Works/Engineering roles as part of this strategy. Once confirmed, complete the following steps in line with a complete and rounded TSMO Program: • Revise position descriptions within Human Resources and re-position staff as needed. • Create new positions both in the Public Works/Engineering group as well as other partner departments to serve specific TSMO functions. • Evaluate (at a later date) where Inspections take place in the Town's organizational structure.	Updated Public Works org chart New job titles and associated descriptions	• Utilize the TSMO Function Evaluation process prepared for this plan to help show functions not getting accomplished with current staffing arrangement to help justify additional or altered staffing needs. • Pursue liaisons between Public Works and IT in the form of 'embedded' staff, rather than as 'dedicated' staff. • Mesa and Peoria may have good experiences and lessons learned and examples of benefits of certain staff positions or organizational structures.	Costs to be assigned by Town based on pay grades associated with recommended new positions in Section 4.1	Near and Mid-term Revisit staffing structure of having Inspectors under Development Services at the time when the Town is built out and projects are focused on maintaining rather than new construction	Lead: Traffic, Public Works Support: Town Manager's Office, Digital Gvt, IT, Development Services

No.	Category	Strategy	Description/Actions	Deliverable/ Outcome	Considerations	Cost	Timeframe & Updates	Responsible Party
12	People	Implement a quantifiable staffing formula for TSMO staff to justify systematic hiring	• Work with Public Works management staff to vet and create a business case that justifies a 140 device-to-technician threshold, equating to 10 technicians in the near-term. This staffing ratio should be taken to council for approval and then be used to systematically hire additional technician staff as the Town continues to build out its technology and traffic network.	Policy supporting a staff-to-infrastructure ratio for TSMO positions	• The 140-to-1 staff ratio for technology and signal assets and the 100-to-1 staff ratio for fiber assets is based on best practices and federal guidance, such as through the FHWA Traffic Signal Operations and Maintenance Staffing Guidelines. • It is recommended that traffic signal and ITS device maintenance ultimately be performed by the same staff (in line with Strategy 11). • For current infrastructure levels (as of October 2020) the staffing formula would result in a recommended 10 technician staff to support technology and traffic signal maintenance. • All positions shown on the proposed organization chart are existing or underway with the exception of the Traffic Signal Specialist (ITS). This position (and any future positions) will require sustained funding from the Town's General Fund.	None except for staff time	Near-term	Lead: Traffic/ TOC, Streets Support: Public Works, Town Manager's Office
13	People, Infrastructure	Implement a formal training and cross-training program for TSMO staff and other staff who interact with TSMO	• Identify key training and skills that are required for TSMO, including operating and maintaining ITS devices and systems, reviewing plans and performing inspections, implementing traffic operations strategies, networking, data collection and analysis, and others. • Identify resources or develop training materials that can be made available to provide high-level and more detailed training (as necessary) for the different skills and processes. • Identify key staff positions throughout the Town that should participate in different types of training. • Identify processes to hold staff accountable for participating in the training, if it is deemed critical for the success of Town functions (such as for creating redundancy in key skill sets). This might include having it be required as part of a job description or a performance review process.	Training program for TOC, Traffic, Streets, and IT staff	• Detailed training to create staff redundancy for TSMO functions will likely be applicable to staff from: Traffic, TOC, Streets, IT. • Higher-level training to provide a more general awareness of TSMO staff and functions will likely be applicable to staff from: Traffic, Streets, IT, Police, and Fire, as well as other interested departments. • Mesa, Scottsdale, and Chandler may have good experiences and lessons learned for creating on-the-job training.	Some external training programs may have a cost and cost of staff time	Near-term Training materials should be updated as TSMO infrastructure or strategies change	Lead: Traffic Support: Streets, IT, Police, Fire

No.	Category	Strategy	Description/Actions	Deliverable/ Outcome	Considerations	Cost	Timeframe & Updates	Responsible Party
14	Data	Implement performance-based decision making for transportation operations and investments	Implement an Automated Traffic Signal Performance Measure (ATSPM) program and associated MARK 1 dashboard. • Refer to ATSPM Installation Manual and reporting details for technology and data required for ATSPM and MARK 1 applications. • Engage IT in discussions related to equipment (servers, cloud hosting) and software for this task. • Install/ download open source codes for both applications. <u>For Operational Decision Making:</u> • Work with IT department or hire a contractor to configure ATSPM and MARK 1 applications at the TOC. • Identify training for ATSMP that TOC and other interested staff could take to understanding how to use and understand ATSPMs. • Decide thresholds for metrics in the system that warrant a response (ex: looking at a camera; conducting a study; changing a timing plan), and update operator SOPs with appropriate thresholds and responses. <u>For Investment Decision Making</u>: Utilize the MARK 1 dashboard that generates monthly or quarterly performance based on ATSPM data, including corridors, device, and staff. • Utilize corridor performance metrics to identify where investments, such as new/upgraded devices or studies, are needed to support improved corridor operations. Corridor performance metrics can also support before-after studies to help show impacts and return-on-investment for traffic management strategies, devices. and systems. • Utilize equipment performance metrics to identify where investments are needed to improve reliability or functionality of existing equipment or communications. • Document key findings from regular reports that are generated and refer to these during annual budgeting processes to support staffing, equipment, and consulting services requests.	ASTPM and MARK 1 platform installation at TOC Staff training Updates to TOC and incident management SOPs Periodic (monthly, quarterly) traffic network performance reports Updated budgeting processes for Traffic Engineering to utilize performance metric input	• There are detection requirements for ATSPM which must be in place for ATSPM to be effective (see Strategy 3). • The two software applications should be included in the infrastructure standards and requirements of Strategy 4 and the database of systems described in Strategy 15. • The Town may want to consider contracting with a consultant to provide ongoing maintenance or support for systems and resulting data outputs. • Operational decision-making outputs may warrant updates to various SOPs that are developed for traffic operations and incident management processes (Strategies 6 and 10). • The Watchdog application through MARK 1 will provide alerts when there are abnormalities in operational conditions or equipment, which may help indicate something is wrong.	Staff time or consultant services to configure platforms ($50,000) and ongoing support services if desired Cost of new servers if required Ongoing hosting fee for cloud hosting (~$80 per month)	Near-term System should be upgraded to include any new traffic signals or upgraded detection as they are installed May want to undertake periodic updates to the open source platforms as new versions become available	Lead: Traffic /TOC Support: IT

No.	Category	Strategy	Description/Actions	Deliverable/ Outcome	Considerations	Cost	Timeframe & Updates	Responsible Party

15	Data	Consolidate systems that collect and track data and make access available to all Town departments	Implement a process that helps to develop and maintain a catalogue of existing systems utilized in the Town and the functions/data that the system can provide to help identify opportunities where multiple departments can leverage a single system.
			• Assemble a list of known systems that are being used by each department in the Town by identifying:
			  o Which departments use the system
			  o For what functions does the Town utilize the system
			  o What are the data produced from the system
			• Outreach to all departments to confirm list or add systems that may not be captured
			• Work to understand any additional functionalities and data available from each of the systems, even if that function or data point is not currently being used. Identify areas where there are overlaps in functions or data generated by two, disparate systems and explore if there are opportunities to utilize one system for functions of data needs that may currently be accomplished by two.
			• Make this database of systems available to all Town departments and implement a process that requires staff to reference this database prior to requesting or purchasing any new systems.
			• Continue current IT efforts to develop a Town-wide data repository that is searchable and accessible to all Town staff. Expand data sources based on findings from the system catalogue that is developed as part of this strategy.
			• Utilize the data repository to create discipline-specific dashboards, including a traffic dashboard for internal use.
				Catalogue of existing Town systems and the data/ functions available Town-wide data repository that feeds a traffic dashboard	IT has two initiatives underway that will support the two facets of this strategy:
					• The IT Roadmap outlines an internal departmental process for how they would like to receive, evaluate, and prioritize IT-related requests from Town staff. It will allow them to track active projects and tasks and make sure that IT staff time is being prioritized appropriately. One part of this roadmap is establishing a Privacy and Security review, which IT would perform for any projects related to systems or data. Implementing this kind of review will help IT be the 'gatekeeper' of the proposed catalogue of systems, since all requests will need to go through IT, and can provide the check point where the catalogue is referenced to see if there are existing systems that could support the requested function/data.
					• IT is currently developing and operating a 'data lake' that ingests data sources from Town systems into a single location, regardless of the data format and where the data resides. As part of this project, IT staff have started to develop a data dashboard using the data and additional input from Town staff on what they would like to see, and this dashboard is intended to be available to Town staff.
						None except for staff time	Near-term (some parts are currently in process)	Lead: IT Support: all Town Departments

16	Data	Develop an internal and external data dashboard	Internal (Traffic/TOC) Dashboard
			• See Strategy 14.
			External (All Town Departments/Public) Dashboard
			• Establish connections between the IT data repository (see Strategy 15) and the following sources/data:
			  o Traffic/TOC MARK 1 platform for historical traffic condition information
			  o Town One Stop Shop for construction/ roadwork data
			  o Police Computer Aided Dispatch (CAD) system for crash location information (only pulling limited information fields for traffic-related incidents, as to avoid data privacy concerns)
			  o TOC traffic management system for real-time camera feeds or snapshots
			• Create a Transportation-specific tab on the Alex system that links to a customizable user interface for a variety of transportation information, as identified by Traffic and TOC staff.
			• Link the IT database with the Alex system to feed relevant information into the Alex interface.
			• Create interfaces to external data sources based on the desired interface, which might include Google maps, Valley Metro transit, Twitter, or local weather.
				Transportation Page on Alex website with real-time traffic data map	• This strategy should build upon and expand data developed from Strategies 14 and 15.
					• Having access to real-time construction restriction information is a high priority for many Town departments and the public. Connecting to the Town's One Stop Shop application will help with providing this link, but there will need to be additional processes put into place in order to provide real-time restrictions, as opposed to the permitted information. The Town should consider putting responsibility on contractors for entering information into One Stop Shop in real-time through the permit information form, including when they initiate any roadwork restrictions and when the restrictions are lifted.
						See Strategy 14 for relevant costs	Mid-term Strategies need to be completed prior to this strategy being pursued	Lead: Digital Government Support: IT, Traffic/TOC, Streets, Police

Appendix D – Asset Replacement Program

Asset Replacement Program – Phase 1 (FY2020)

Phase 1 of the asset replacement program for the Town includes replacement of 10 CCTV and upgrading to video detection that also provide turning movement counts at 23 major intersections. CCTVs locations were chosen based on the age of existing cameras. Video detection locations were those listed in the initial project application. The table below shows the intersections recommended for improvements.

Funded:	CCTVs:	10	
	Video Detection:	23	
Recommended:	CCTVs:	10	
	Intersections	Higley Road	Baseline Road
		Higley Road	Loop 202
		Higley Road	Pecos Road
		Santan Village Parkway	Loop 202
		Greenfield Road	Pecos Road
		Val Vista Drive	Ray Road
		Val Vista Drive	Riggs Road
		Gilbert Road	Guadalupe Road
		Cooper Road	Elliot Road
		McQueen Road	Elliot Road
	Video Detection:	23	
	Intersections	Recker Road	Ray Road
		Higley Road	Elliot Road
		Higley Road	Ray Road
		Higley Road	Queen Creek Road
		Higley Road	Riggs Road
		Greenfield Road	Warner Road
		Greenfield Road	Pecos Road
		Val Vista Drive	Baseline Road
		Val Vista Drive	Warner Road
		Val Vista Drive	Williams Field Road
		Val Vista Drive	Pecos Road
		Val Vista Drive	Riggs Road
		Lindsay Road	Ray Road
		Lindsay Road	Williams Field Road
		Lindsay Road	Pecos Road
		Lindsay Road	Queen Creek Road
		Gilbert Road	Guadalupe Road
		Gilbert Road	Elliot Road
		Gilbert Road	Warner Road
		Gilbert Road	Ray Road
		Gilbert Road	Williams Field Road
		Cooper Road	Guadalupe Road
		Cooper Road	Elliot Road

Asset Replacement Program – Phase 2 (FY2021)

Phase 2 of the asset replacement program for the Town includes replacement of 10 CCTV in addition to upgrading to video detection that also provide turning movement counts at 20 major intersections. CCTVs locations were chosen based on the age of existing cameras. Video detection locations were determined in comparing existing intersections with video detection to other remaining major intersections without video detection. The table below includes the intersections recommended for improvements.

Funded:	CCTVs:	10	
	Video Detection:	20	
Recommended:	CCTVs:	10	
	Intersections	Power Road	Pecos Road
		Recker Road	Baseline Road
		Recker Road	Williams Field Road
		Higley Road	Ray Road
		Val Vista Drive	Guadalupe Road
		Val Vista Drive	Queen Creek Road
		Lindsay Road	Ray Road
		Lindsay Road	Pecos Road
		Lindsay Road	Germann Road
		Gilbert Road	Elliot Road
	Video Detection:	20	
	Intersections	Power Road	Pecos Road
		Power Road	Germann Road
		Power Road	Queen Creek Road
		Recker Road	Baseline Road
		Recker Road	Guadalupe Road
		Recker Road	Elliot Road
		Recker Road	Warner Road
		Recker Road	Williams Field Road
		Recker Road	Pecos Road
		Ranch House	Germann Road
		Higley Road	Baseline Road
		Higley Road	Guadalupe Road
		Higley Road	Warner Road
		Higley Road	Pecos Road
		Higley Road	Germann Road
		Higley Road	Ocotillo Road
		Greenfield Road	Baseline Road
		Greenfield Road	Guadalupe Road
		Greenfield Road	Elliot Road
		Santan Village Parkway	Ray Road

Asset Replacement Program – Phase 3 (FY2022)

Phase 2 of the asset replacement program for the Town includes replacement of 10 CCTV in addition to upgrading to video detection that also provide turning movement counts at 20 major intersections. Video detection locations were determined in comparing existing intersections with video detection to other remaining major intersections without video detection. Only 10 remaining major intersections required upgrading to video detection. CCTVs locations were chosen based on the age of existing cameras. All intersection with cameras installed in 2015 or before were selected for replacement. During the inventory comparison, it was noted that intersections are currently needing EVP replacement. With the additional funds available in Phase 3, a total of 15 intersections were selected for EVP replacement. The table below includes the intersections recommended for improvements.

Funded:	CCTVs:	10	
	Video Detection:	20	
Recommended:	CCTVs:	10	
	Intersections	Recker Road	Elliot Road
		Higley Road	Elliot Road
		Higley Road	Williams Field Road
		Greenfield Road	Baseline Road
		Greenfield Road	Guadalupe Road
		Santan Village Parkway	Williams Field Road
		Val Vista Drive	Baseline Road
		Lindsay Road	Queen Creek Road
		Gilbert Road	Warner Road
		Gilbert Road	Williams Field Road
	Video Detection:	10	
	Intersections	Greenfield Road	Germann Road
		Greenfield Road	Queen Creek Road
		Greenfield Road	Ocotillo Road
		Greenfield Road	Chandler Heights Road
		Val Vista Drive	Elliot Road
		Val Vista Drive	Germann Road
		Val Vista Drive	Queen Creek Road
		Val Vista Drive	Ocotillo Road
		Val Vista Drive	Chandler Heights Road
		Lindsay Road	Germann Road
	Additional CCTVs: (minor intersections)	36	
	Intersections	Baseline Road	Claiborne
		Higley Road	Inverness
		Higley Road	Houston
		Williams Field Road	Parkcrest
		Gilbert Road	Houston
		Gilbert Road	Juniper
		Higley Road	Vest
		Pecos Road	Market
		Gilbert Road	Vaughn
		Power Road	Verona
		Gilbert Road	Trail Crossing
		Gilbert Road	Fairview

		Santan Village Parkway	Market Street
		Higley Road	Willis
		Recker Road	Higley High
		Baseline Road	Driftwood
		Warner Road	Fire Station#7
		Baseline Road	Dana Park
		Baseline Road	39th Street
		Recker Road	Guadalupe Road
		Val Vista Drive	Warner Road
		Lindsay Road	Houston
		Higley Road	Germann Road
		Higley Road	Seville
		Higley Road	Agritopia
		Pecos Road	Ranch House
		Val Vista Drive	Lakeside
		Recker Road	Pecos Road
		Power Road	Germann Road
		McQueen Road	Guadalupe Road
		Val Vista Drive	Germann Road
		Power Road	Queen Creek Road
		Lindsay Road	Settlers Point
		Riggs Road	Adora Trails
		Williams Field Road	Market
		Val Vista Drive	Mercy
	EVPs:	15	
	Intersections	Val Vista Drive	Guadalupe Road
		Val Vista Drive	Elliot Road
		Val Vista Drive	Warner Road
		Val Vista Drive	Ray Road
		Val Vista Drive	Williams Field Road
		Val Vista Drive	Pecos Road
		Val Vista Drive	Loop 202
		Val Vista Drive	Germann Road
		Val Vista Drive	Queen Creek Road
		Val Vista Drive	Ocotillo Road
		McQueen Road	Guadalupe Road
		Cooper Road	Guadalupe Road
		Gilbert Road	Guadalupe Road
		Lindsay Road	Guadalupe Road
		Greenfield Road	Guadalupe Road

Ongoing Asset Replacement Program

The following pages are representative of the full spreadsheet tool (where the unit costs and quantities feeds into values) that provides the Town with a summary and method of determining ongoing asset needs from the traffic operations perspective as well as to support future signalized intersection needs.

Summary of Unit Costs and Quantities Required for Ongoing Asset Replacement Program for Traffic Operations Center Equipment Types

								Existing					Future																								
								Yearly Replacement Cycle (identified by 2050 year)																													
Equipment Type	**Lifecycle Timeframe**	**# of TS Locations (Current)**	**# of TS Locations (Future)**	**Annual O&M Costs Per Unit**	**Annual O&M Cost Total (Current)**	**Annual O&M Cost Total (Future)**	**Replacement Cycle Recommended**	**21**	**22**	**23**	**24**	**25**	**26**	**27**	**28**	**29**	**30**	**31**	**32**	**33**	**34**	**35**	**36**	**37**	**38**	**39**	**40**	**41**	**42**	**43**	**44**	**45**	**46**	**47**	**48**	**49**	**50**
TRAFFIC OPERATIONS CENTER ASSETS																																					
PTZ Units	10 years	159	200	$ 450	$ 71,550	$ 90,000	Replacing 20 intersections per year will keep a majority less than 10 years old	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20
Arterial DMS	10 years	2	2	$ 450	$ 900	$ 900	Replace/upgrade every 10 years starting in future (2027); no anticipated growth								1	1									1	1									1	1	
ARID	10 years	86	100	$ 200	$ 17,200	$ 20,000	Replace/upgrade every 10 years starting in future (2025)						10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
Advanced Radar Detection	10 years	24	100	$ 200	$ 4,800	$ 20,000	Replace every 10 years; major intersections require 4 devices; minor intersections require 2 devices; 24 existing intersections but 74 actual devices/approaches equipped	5	5	5	5	5	10	10	10	10	10	10	10	10	10	10	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20
Field Network Switches	7 years	246	270	$ 200	$ 49,200	$ 54,000	Replace every 7 years	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35
Fiber Optic Cable Plant	25 years	84.24	100	$ -	$ -	$ -	Begin upgrading 4 miles of fiber cable per year to complete full replacement within 25 years; needs to be consistent with Fiber Optic Strategic Build Out															4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Wireless Radio	10 years	102	50	$ 200	$ 20,400	$ 10,000	Fiber to replace most radios as growth occurs; replace 5 per year in future for remaining minimal anticipated radio use	10	10	10	10	10	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
Network Core Switch	10 years	4	4	$ 200	$ 800	$ 800	Replace 100% every 10 years; assuming the two Cisco switches in the TOC fall are captured in the Town IT Asset Replacement Program	2	2										2	2									2	2							
Rack Equipment	15 years	4	4	$ -	$ -	$ -	Replace every 15 years consistent when TMC video wall and network core switches are updated													4																	
Workstation Displays	7 years	6	6	$ -	$ -	$ -	Replace/upgrade every 7 years starting in future (2026)							3	3						3	3						3	3						3	3	
Servers	5 years	7	7	$ 200	$ 1,400	$ 1,400	Replace every 5 years; currently older than 6 years	3	4				3	4				3	4				3	4				3	4				3	4			
Uninterruptible Power Supply for TMC Server Room	15 years	3	3	$ -	$ -	$ -	Replace every 15 years; last installed in 2009					3															3										
Video Wall	15 years	1	1	$ -	$ -	$ -	Replace every 15 years; last done in 2017 and scheduled for building renovation in current CIP													1															1		
TMC Software	10 years	1	1	$ 15,000	$ 15,000	$ 15,000	Annual fee for software maintenance contract	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
TOTAL					**$ 181,000**	**$ 212,000**																															

Summary of Costs (Based on Quantities and Unit Costs) Required for Ongoing Asset Replacement Program for Traffic Operations Center Equipment Types

		Yearly Replacement Capital Costs (based on cycle outlined to left)																													
Equipment Type	**Typical Capital Cost**	**21**	**22**	**23**	**24**	**25**	**26**	**27**	**28**	**29**	**30**	**31**	**32**	**33**	**34**	**35**	**36**	**37**	**38**	**39**	**40**	**41**	**42**	**43**	**44**	**45**	**46**	**47**	**48**	**49**	**50**
TRAFFIC																															
PTZ Units	$ 5,500	$ 110,000	$ 110,000	$ 110,000	$ 110,000	$ 110,000	$ 110,000	$ 110,000	$ 110,000	$ 110,000	$ 110,000	$ 110,000	$ 110,000	$ 110,000	$ 110,000	$ 110,000	$ 110,000	$ 110,000	$ 110,000	$ 110,000	$ 110,000	$ 110,000	$ 110,000	$ 110,000	$ 110,000	$ 110,000	$ 110,000	$ 110,000	$ 110,000	$ 110,000	$ 110,000
Arterial DMS	$ 115,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 115,000	$ 115,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 115,000	$ 115,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 115,000	$ 115,000	$ -
ARID	$ 3,400	$ -	$ -	$ -	$ -	$ -	$ 34,000	$ 34,000	$ 34,000	$ 34,000	$ 34,000	$ 34,000	$ 34,000	$ 34,000	$ 34,000	$ 34,000	$ 34,000	$ 34,000	$ 34,000	$ 34,000	$ 34,000	$ 34,000	$ 34,000	$ 34,000	$ 34,000	$ 34,000	$ 34,000	$ 34,000	$ 34,000	$ 34,000	$ 34,000
Advanced Radar Detection	$ 6,250	$ 31,250	$ 31,250	$ 31,250	$ 31,250	$ 31,250	$ 62,500	$ 62,500	$ 62,500	$ 62,500	$ 62,500	$ 62,500	$ 62,500	$ 62,500	$ 62,500	$ 62,500	$ 125,000	$ 125,000	$ 125,000	$ 125,000	$ 125,000	$ 125,000	$ 125,000	$ 125,000	$ 125,000	$ 125,000	$ 125,000	$ 125,000	$ 125,000	$ 125,000	$ 125,000
Field Network Switches	$ 5,000	$ 175,000	$ 175,000	$ 175,000	$ 175,000	$ 175,000	$ 175,000	$ 175,000	$ 175,000	$ 175,000	$ 175,000	$ 175,000	$ 175,000	$ 175,000	$ 175,000	$ 175,000	$ 175,000	$ 175,000	$ 175,000	$ 175,000	$ 175,000	$ 175,000	$ 175,000	$ 175,000	$ 175,000	$ 175,000	$ 175,000	$ 175,000	$ 175,000	$ 175,000	$ 175,000
Fiber Optic Cable Plant	$ 20,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 80,000	$ 80,000	$ 80,000	$ 80,000	$ 80,000	$ 80,000	$ 80,000	$ 80,000	$ 80,000	$ 80,000	$ 80,000	$ 80,000	$ 80,000	$ 80,000	$ 80,000	$ 80,000
Wireless Radio	$ 4,500	$ 45,000	$ 45,000	$ 45,000	$ 45,000	$ 45,000	$ 22,500	$ 22,500	$ 22,500	$ 22,500	$ 22,500	$ 22,500	$ 22,500	$ 22,500	$ 22,500	$ 22,500	$ 22,500	$ 22,500	$ 22,500	$ 22,500	$ 22,500	$ 22,500	$ 22,500	$ 22,500	$ 22,500	$ 22,500	$ 22,500	$ 22,500	$ 22,500	$ 22,500	$ 22,500
Network Core Switch	$ 12,500	$ 25,000	$ 25,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 25,000	$ 25,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 25,000	$ 25,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Rack Equipment	$ 1,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 4,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Workstation Displays	$ 5,000	$ -	$ -	$ -	$ -	$ -	$ -	$ 15,000	$ 15,000	$ -	$ -	$ -	$ -	$ -	$ 15,000	$ 15,000	$ -	$ -	$ -	$ -	$ -	$ 15,000	$ 15,000	$ -	$ -	$ -	$ -	$ -	$ 15,000	$ 15,000	$ -
Servers	$ 7,500	$ 22,500	$ 30,000	$ -	$ -	$ -	$ 22,500	$ 30,000	$ -	$ -	$ -	$ 22,500	$ 30,000	$ -	$ -	$ -	$ 22,500	$ 30,000	$ -	$ -	$ -	$ 22,500	$ 30,000	$ -	$ -	$ -	$ 22,500	$ 30,000	$ -	$ -	$ -
Uninterruptible Power Supply for	$ 200	$ -	$ -	$ -	$ -	$ 600	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 600	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Video Wall	$ 100,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 100,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 100,000	$ -	$ -
TMC Software	$ 20,000	$ 20,000	$ 20,000	$ 20,000	$ 20,000	$ 20,000	$ 20,000	$ 20,000	$ 20,000	$ 20,000	$ 20,000	$ 20,000	$ 20,000	$ 20,000	$ 20,000	$ 20,000	$ 20,000	$ 20,000	$ 20,000	$ 20,000	$ 20,000	$ 20,000	$ 20,000	$ 20,000	$ 20,000	$ 20,000	$ 20,000	$ 20,000	$ 20,000	$ 20,000	$ 20,000
TOTAL		$ 428,750	$ 436,250	$ 381,250	$ 381,250	$ 381,850	$ 446,500	$ 469,000	$ 554,000	$ 539,000	$ 424,000	$ 446,500	$ 479,000	$ 553,000	$ 439,000	$ 519,000	$ 589,000	$ 596,500	$ 681,500	$ 681,500	$ 567,100	$ 604,000	$ 636,500	$ 591,500	$ 566,500	$ 566,500	$ 589,000	$ 596,500	$ 796,500	$ 696,500	$ 566,500

Appendix E – Recommended Preventative Maintenance Program

Preventative Maintenance Recommendations

Intersection Preventative Maintenance	Recommended Interval
Interior Cabinet Check	
Clean cabinet Interior Check controller lamp and door switch Check fan and thermostat Check filter Check door fit and gasket Check locks and hinges Check/verify for cabinet timing and log sheet Check field block terminal connections Check conflict monitor indications	Annually
Check all detectors	Quarterly
Exterior Cabinet and Field Check	
Check condition of cabinet exterior Check all signal indications Check all pedestrian indications Check pole conditions and hand hole covers	Annually
Check all signal head back plates and visors Check alignment of signals and pedestrian heads Check condition of pull boxes and lids	Quarterly
Intersection Field Check	
Visual check of all traffic loops	Quarterly
Visual check of other traffic system related cabinets	Annually
CCTV Check List Items	Recommended Interval
Visual check of assembly CCTV receiver Video transmitter Fiber distribution unit Cabinet equipment Pole or exterior condition	Annually

ITS Device and Communications Preventative Maintenance Guidelines

Equipment Type	Minor Maintenance	Major Maintenance	Major Rehabilitation	Lifecycle Timeframe
Traffic Signal Systems				
Cabinets	26 weeks	2 – 5 years	10 years	20 years
Signal Heads	26 weeks	2 – 5 years	10 years	20 years
Electronics	13 weeks	N/A	N/A	10 years
Poles	26 weeks	5 years	15 years	50 years
CCTV Camera Systems				
PTZ Units	26 weeks	1 year	3 years	10 years
Dynamic Message Signs				
Sign Case	---	26 weeks	1.5 years	10 years
Protective Devices	26 weeks	1 year	2 years	10 years
Pixels, Modules, and Drivers	---	26 weeks	3 years	6 years
Controllers	---	26 weeks	3 years	6 years
Vehicle Detection Systems				
Loop Detectors and Cables	26 weeks	1 years	5 years	10 years
Cabinets	---	26 weeks	10 years	20 years
Power Supply	26 weeks	5 years	10 years	20 years
Grounding	1 year	5 years	10 years	25 years
Controllers	---	26 weeks	2 years	7 years
Communications Systems				
Fiber Optic Cable Plant	1 year	5 years	25 years	25 years
Fiber Optic Plant Video and Data Equipment	---	26 weeks	3 years	10 years
Spread Spectrum	26 weeks	4 years	10 years	20 years
TMC Equipment				
Video Wall	1 year	2 years	5 years	10 years
Video Wall Processor	1 year	2 years	5 years	10 years
Servers	26 weeks	1 year	2 years	5 years
Rack Equipment	-	1 year	2 years	5 years
Workstations	26 weeks	2 years	2 years	5 years
Workstation Displays	26 weeks	1 year	3 years	5 years
Uninterruptible Power Supply	1 year	5 years	10 years	20 years

Appendix F – Primary ITS Capital Project Details

A primary ITS capital project to fill gaps to bring the remaining major intersections to the standard intersection ITS device layout includes the devices found in the table below. The project would include ARID, CCTV, and advanced radar detection locations.

CCTV	1	
Intersections	Val Vista Drive	Chandler Heights Road
ARID	2	
Intersections	Ranch House	Queen Creek Road
	Santan Village Parkway	Loop 202
Advanced Radar Detection	54	
Intersections	Power Road	Pecos Road
	Power Road	Germann Road
	Power Road	Queen Creek Road
	Recker Road	Guadalupe Road
	Recker Road	Elliot Road
	Recker Road	Warner Road
	Recker Road	Ray Road
	Recker Road	Williams Field Road
	Recker Road	Pecos Road
	Ranch House	Germann Road
	Higley Road	Guadalupe Road
	Higley Road	Elliot Road
	Higley Road	Loop 202
	Higley Road	Ray Road
	Higley Road	Williams Field Road
	Higley Road	Queen Creek Road
	Higley Road	Ocotillo Road
	Higley Road	Chandler Heights Road
	Higley Road	Riggs Road
	Greenfield Road	Baseline Road
	Greenfield Road	Elliot Road
	Greenfield Road	Warner Road
	Santan Village Parkway	Williams Field Road
	Santan Village Parkway	Loop 202
	Greenfield Road	Pecos Road
	Greenfield Road	Queen Creek Road
	Greenfield Road	Ocotillo Road
	Greenfield Road	Chandler Heights Road
	Val Vista Drive	Baseline Road
	Val Vista Drive	Guadalupe Road
	Val Vista Drive	Elliot Road
	Val Vista Drive	Warner Road
	Val Vista Drive	Ray Road
	Val Vista Drive	Chandler Boulevard

	Val Vista Drive	Pecos Road
	Val Vista Drive	Loop 202
	Val Vista Drive	Ocotillo Road
	Val Vista Drive	Chandler Heights Road
	Val Vista Drive	Riggs Road
	Lindsay Road	Guadalupe Road
	Lindsay Road	Elliot Road
	Lindsay Road	Warner Road
	Lindsay Road	Ray Road
	Lindsay Road	Chandler Boulevard
	Lindsay Road	Pecos Road
	Lindsay Road	Germann Road
	Lindsay Road	Queen Creek Road
	Gilbert Road	Elliot Road
	Gilbert Road	Warner Road
	Gilbert Road	Chandler Boulevard
	Cooper Road	Elliot Road
	Cooper Road	Warner Road
	McQueen Road	Guadalupe Road
	McQueen Road	Elliot Road

Appendix G – TSMO Functions Evaluation Summarized by Scope and Position

TSMO Functions Evaluation – Summarized by Scope (Existing)

Scale (of Assignment):

None – Task is not being done and nobody is assigned to role.

Low – Task is being done as needed (ad hoc) though may not be officially assigned.

Medium – Task is being done occasionally and is assigned to a position.

High – Task is being done regularly and has a formal staff/schedule.

TSMO Function	Scope	Details	Town Department/s	Staff Position Performed	Scale	Liaison With
Planning	Performance Measurement	Intersection LOS (Town-wide Oversight)	None	None	None	Development Services/Planning
Planning	Performance Measurement	Travel Time/Congestion (Town-wide Oversight)	PW/Engineering	ITS Engineer (was Asst. Traffic Engineer)	Low	Development Services/Planning
Planning	Performance Measurement	ATSPM Review (MARK1)	PW/Engineering	None	Low	
Planning	Performance Measurement	Crash Data Performance Measures	None	None	None	Development Services/Planning
Planning	Performance Measurement	Traffic Count Data	None	None	None	Development Services/Planning
Planning	Project Identification	Long-Term ITS/TSMO Planning	PW/Engineering	Town Engineer	Low	Development Services/Planning
Planning	Project Identification	Needs Assessment/ Prioritization	PW/Engineering	Asst. Traffic Engineer (Annual Request)	Med	
Planning	Project Identification	ITS/TSMO Inventory (Asset Management)	PW/Engineering	ITS Specialist	Med	
Planning	Project Identification	Scoping Review (Signals)	PW/Engineering	Asst. Traffic Engineer	Med	
Planning	Project Identification	Scoping Review (ITS/Fiber)	PW/Engineering	ITS Engineer	Med	

TSMO Function	Scope	Details	Town Department/s	Staff Position Performed	Scale	Liaison With
Planning	Programming/ Funding	Project Cost Estimation	PW/Engineering	CIP Project Managers	Med	
Planning	Programming/ Funding	O&M Cost Estimation	PW/Engineering	Traffic Engineer/ITS Engineer	None	OMB Budget Director
Planning	Programming/ Funding	Funding Opportunities	PW/Engineering	Traffic Engineer/ITS Engineer	Low	OMB Budget Director
Planning	Programming/ Funding	Lifecycle Analysis (Asset Management)	PW/Engineering	Traffic Engineer/ITS Engineer	None	OMB Budget Director
Design	Project Management	CIP Project Management (>$100K)	PW/Engineering	CIP Project Managers	High	
Design	Project Management	Internal Project Management (as needed)	PW/Engineering	Traffic Engineer/ITS Engineer	Med	
Design	Traffic Studies	Traffic Studies (Internally Developed)	PW/Engineering	Asst. Traffic Engineer	Med	
Design	Traffic Studies	Special Projects	PW/Engineering	Asst. Traffic Engineer	Low	
Design	Traffic Studies	Warrant Analysis (Internally Developed)	PW/Engineering	Asst. Traffic Engineer	Med	
Design	Plan Review (CIP)	Operational Traffic Review (CIP)	PW/Engineering	Traffic Engineer/ITS Engineer	Med	
Design	Plan Review (CIP)	Signing/Striping Review (CIP)	PW/Engineering	ITS Analyst/Traffic Engineering Specialist	Med	
Design	Plan Review (CIP)	Traffic Signal Review (CIP)	PW/Engineering	ITS Engineer/ITS Analyst/Traffic Engineering Specialist	High	
Design	Plan Review (CIP)	ITS Review (CIP)	PW/Engineering	ITS Analyst/ITS Specialist	High	
Design	Plan Review (CIP)	Construction Impacts (CIP)	Development Services	Engineering Inspectors (that also does TTC/signing/ striping)	High	
Design	Plan Review (CIP)	TTC Review (CIP)	Development Services	Engineering Inspectors (that also does TTC/signing/ striping)	High	
Design	Plan Review (CIP)	ADA Review (CIP Signal Projects)	PW/Engineering	ITS Analyst	Low	Traffic Engineer/Asst. Traffic Engineer
Design	Plan Review (CIP)	ADA Review (CIP Non-Signal Projects)	None	None	None	

TSMO Function	Scope	Details	Town Department/s	Staff Position Performed	Scale	Liaison With
Design	Plan Review (Development)	Operational Traffic Review (DevServ)	PW/Engineering	ITS Engineer/ITS Analyst	Med	Development Services
Design	Plan Review (Development)	Signing/Striping Review (DevServ)	PW/Engineering	Traffic Engineering Specialist	Med	Development Services
Design	Plan Review (Development)	Traffic Signal Review (DevServ)	PW/Engineering	ITS Engineer/ITS Analyst	High	Development Services
Design	Plan Review (Development)	ITS Review (DevServ)	PW/Engineering	ITS Engineer/ITS Analyst/ITS Specialist	High	Development Services
Design	Plan Review (Development)	Construction Impacts (DevServ)	Development Services	Engineering Inspectors (that also does TTC/signing/ striping)	Med	PW/Engineering
Design	Plan Review (Development)	TTC Review (DevServ)	Development Services	Engineering Inspectors (that also does TTC/signing/ striping)	Med	PW/Engineering
Design	Plan Review (Development)	ADA Review (DevServ Signal Projects)	PW/Engineering	ITS Analyst	Low	Development Services
Design	Plan Review (Development)	ADA Review (DevServ Non-Signal Projects)	Development Services	Senior Development Engineer	Low	PW/Engineering
Construction	Verification	Plan Verification	None (Third Party Contractor)	None (Third Party Contractor)	None	
Construction	Traffic Control	TTC Inspection	Development Services	TTC and Signing/Striping Inspection	High	
Construction	Traffic Control	TTC Public Notification	None (Consultant)	None (Consultant Staff)	None	
Construction	Traffic Control	Identify TOC Coordination Need	Development Services	Engineering Inspectors (that also does TTC/signing/ striping)	High	PW/Engineering
Construction	Traffic Control	TOC Coordination	None (Contractor)	None (Contractor Staff)	Low	
Construction	Inspection	Construction Review Coordination	Development Services	Engineering Inspectors (that also does TTC/signing/ striping)	Med	

TSMO Function	Scope	Details	Town Department/s	Staff Position Performed	Scale	Liaison With
Construction	Inspection	Signing/Striping Inspection	Development Services	TTC and Signing/Striping Inspection	High	
Construction	Inspection	Traffic Signal and ADA Inspection	PW/Engineering	ITS Analyst	High	
Construction	Inspection	ITS Inspection (Signal Equipment)	PW/Engineering	ITS Analyst	Med	
Construction	Inspection	ITS Inspection (Communications Equipment)	PW/Engineering	ITS Specialist	High	
Construction	Inspection	ITS Inspection (Non-Signal Equipment)	PW/Engineering	ITS Specialist	High	
Construction	Inspection	Utility Inspection (Power)	PW/Engineering	ITS Analyst	Low	
Construction	Inspection	ADA Inspection (Non-Traffic Signal)	None	None	None	
Operations	Operational Traffic Analysis	Intersection LOS (Specific Issues)	PW/Engineering	None	None	
Operations	Operational Traffic Analysis	ATSPM Analysis	PW/Engineering	None	None	
Operations	Operational Traffic Analysis	Safety Analysis (Countermeasures)	PW/Engineering	None	None	
Operations	Operational Traffic Analysis	Access Management	PW/Engineering	None	None	
Operations	Operational Traffic Analysis	Bicycle/Pedestrian Evaluations	Development Services	Transportation Planner	None	
Operations	Traffic Operations Center	ITS Software Management	PW/Engineering	ITS Analyst	Low	
Operations	Traffic Operations Center	ITS Network Hardware Management	PW/Engineering	ITS Specialist	Low	
Operations	Traffic Operations Center	ITS Security/Firewall	PW/Engineering	None	None	
Operations	Traffic Operations Center	Incident Tracking	None	None	None	
Operations	Traffic Operations Center	Police/Fire Coordination (TIM)	PW/Engineering	ITS Engineer	Low	

TSMO Function	Scope	Details	Town Department/s	Staff Position Performed	Scale	Liaison With
Operations	Traffic Operations Center	PTZ Camera Control	PW/Engineering	ITS Specialist	Med	
Operations	Traffic Operations Center	Traffic Signal Changes (Real-time)	PW/Engineering	ITS Engineer	Low	
Operations	Traffic Operations Center	Construction Activity Coordination	PW/Engineering and Development Services	ITS Engineer/Engineering Inspectors	Med	
Operations	Traffic Operations Center	Incident Coordination	PW/Engineering	ITS Engineer	Low	Police PIO/Digital Media PIO
Operations	Traffic Operations Center	Regional Involvement	PW/Engineering	ITS Engineer	Low	
Operations	Traffic Signal Timing	Synchro/TranSync Network Updates	None	None	None	
Operations	Traffic Signal Timing	ATSPM Adjustments	None	None	None	
Operations	Traffic Signal Timing	Signal Timing Plan Development	PW/Engineering	ITS Engineer	Low	
Operations	Traffic Signal Timing	Signal Timing Plan Implementation	PW/Engineering	ITS Analyst	Low	
Operations	Traffic Signal Timing	Signal Timing Evaluation	None	None	None	
Operations	Data Requests	Crash Record Requests	None	None	None	
Operations	Public Complaints	Receipt of Complaints	PW/Engineering/ Digital Gov	Traffic Safety Specialist/Digital Gov/ITS Engineer	Med	
Operations	Public Complaints	Complaint Tracking	Digital Government/PW Engineering	Public Information Officer/Traffic Safety Specialist	Med	
Operations	Public Complaints	Complaint Response (Signal Timing)	PW/Engineering/ Streets	ITS Engineer/Streets Foreman	Med	
Operations	Public Complaints	Complaint Response (Operations)	PW/Engineering	ITS Engineer	Med	

TSMO Function	Scope	Details	Town Department/s	Staff Position Performed	Scale	Liaison With
Operations	Public Complaints	Complaint Resolution (Signal Timing)	PW/Engineering/ Streets	ITS Engineer/Streets Foreman	Med	
Operations	Public Complaints	Complaint Resolution (Operations)	PW/Engineering	ITS Engineer	Med	
Operations	Public Complaints	Complaint Closure	PW/Engineering/ Streets	Traffic Safety Specialist/Streets /ITS Engineer	Med	
Maintenance	Signing/Striping Maintenance	Initiate Work Order	PW/Engineering/Streets	Traffic Engineering Specialist/Streets Foreman	Med	
Maintenance	Signing/Striping Maintenance	Signing/Striping Work Orders	PW/Streets	Streets Maintenance Worker	Med	
Maintenance	Traffic Signal Maintenance	Preventive Maintenance (Traffic Signal)	PW/Streets	Traffic Signal Specialist	Low	
Maintenance	Traffic Signal Maintenance	Emergency Repair (Traffic Signal)	PW/Streets	Traffic Signal Specialist	Med	
Maintenance	Traffic Signal Maintenance	Detection Health (Traffic Signal)	PW/Streets	Traffic Signal Specialist	Low	
Maintenance	Traffic Signal Maintenance	EVP Status (Traffic Signal)	PW/Streets	Traffic Signal Specialist	Low	
Maintenance	Traffic Signal Maintenance	Utility Coordination (Power)	PW/Streets	Traffic Signal Specialist	Med	
Maintenance	ITS Maintenance	Preventative Maintenance (ITS)	PW/Engineering	ITS Specialist	Low	
Maintenance	ITS Maintenance	ITS Communication Links	PW/Engineering	ITS Specialist	High	
Maintenance	ITS Maintenance	IP Address Management	PW/Engineering	ITS Specialist	High	
Maintenance	ITS Maintenance	PTZ Camera Maintenance	PW/Engineering	ITS Specialist	Low	
Maintenance	ITS Maintenance	DMS Maintenance	PW/Streets	Traffic Signal Specialist	Low	
Maintenance	ITS Maintenance	ARID Device Maintenance	PW/Engineering	ITS Specialist	Low	
Maintenance	ITS Maintenance	School Zone Flashers/RRFB's	PW/Streets	Traffic Signal Specialist	Low	

TSMO Functions Evaluation – Summarized by Scope (Proposed)

TSMO Function	Scope	Details	Town Department/s	Staff Position Responsible	Staff Position Accountable	Staff Position Consulted	Staff Position Informed	Liaison With
Planning	Performance Measurement	Intersection LOS (Town-wide Oversight)	PW/ Engineering	Asst. Traffic Engineer	Traffic Engineer	Traffic Studies Engineer	Town Engineer	DevServ/ Planning
Planning	Performance Measurement	Travel Time/Congestion (Town-wide Oversight)	PW/ Engineering	Asst. Traffic Engineer	Traffic Engineer	Traffic Studies Engineer	Town Engineer	DevServ/ Planning
Planning	Performance Measurement	ATSPM Review (MARK1)	PW/ Engineering	Asst. Traffic Engineer	Traffic Engineer	Traffic Studies Engineer	Town Engineer	
Planning	Performance Measurement	Crash Data Performance Measures	PW/ Engineering	Traffic Safety Specialist	Asst. Traffic Engineer		Town Engineer	DevServ/ Planning
Planning	Performance Measurement	Traffic Count Data	PW/ Engineering	Traffic Studies Engineer	Asst. Traffic Engineer			DevServ/ Planning
Planning	Project Identification	Long-Term ITS/TSMO Planning	PW/ Engineering	Traffic Engineer	Town Engineer	Asst. Traffic Engineer	PW Director	DevServ/ Planning
Planning	Project Identification	Needs Assessment/ Prioritization	PW/ Engineering	Traffic Engineer	Town Engineer	Asst. Traffic Engineer	PW Director	DevServ / Planning
Planning	Project Identification	ITS/TSMO Inventory (Asset Management)	PW/ Engineering	ITS Specialist	ITS Engineer	Signals Supervisor	Traffic Engineer	OMB Budget Director
Planning	Project Identification	Scoping Review (Signals)	PW/ Engineering	ITS Engineer	Traffic Engineer	ITS Specialist	CIP Project Manager	
Planning	Project Identification	Scoping Review (ITS/Fiber)	PW/ Engineering	ITS Engineer	Traffic Engineer	ITS Network Engineer	CIP Project Manager	
Planning	Programming/ Funding	Project Cost Estimation	PW/ Engineering	CIP Project Managers	Town Engineer	Traffic Engineer		
Planning	Programming/ Funding	O&M Cost Estimation	PW/ Engineering	CIP Project Managers	Town Engineer	ITS Engineer	Traffic Engineer	OMB Budget Director
Planning	Programming/ Funding	Funding Opportunities	PW/ Engineering	Traffic Engineer	Town Engineer	ITS Engineer		OMB Budget Director
Planning	Programming/ Funding	Lifecycle Analysis (Asset Management)	PW/ Engineering	Traffic Engineer	Town Engineer	ITS Engineer		OMB Budget Director
Design	Project Management	CIP Project Management (>$100K)	PW/ Engineering	CIP Project Managers	Town Engineer	Traffic Engineer		
Design	Project Management	Internal Project Management (as needed)	PW/ Engineering	ITS Engineer	Traffic Engineer	CIP Project Manager	Town Engineer	
Design	Traffic Studies	Traffic Studies (Internally Developed)	PW/ Engineering	Asst. Traffic Engineer	Traffic Engineer	ITS Engineer	Town Engineer	

TSMO Function	Scope	Details	Town Department/s	Staff Position Responsible	Staff Position Accountable	Staff Position Consulted	Staff Position Informed	Liaison With
Design	Traffic Studies	Special Projects	PW/ Engineering	Asst. Traffic Engineer	Traffic Engineer	ITS Engineer	Town Engineer	
Design	Traffic Studies	Warrant Analysis (Internally Developed)	PW/ Engineering	Asst. Traffic Engineer	Traffic Engineer	ITS Engineer	Town Engineer	
Design	Plan Review (CIP)	Operational Traffic Review (CIP)	PW/ Engineering	Traffic Studies Engineer	Asst. Traffic Engineer	ITS Analyst	CIP Project Manager	
Design	Plan Review (CIP)	Signing/Striping Review (CIP)	PW/ Engineering	Traffic Engineering Specialist	Asst. Traffic Engineer	Traffic Safety Specialist	CIP Project Manager	
Design	Plan Review (CIP)	Traffic Signal Review (CIP)	PW/ Engineering	Signal Supervisor	Traffic Engineer	Traffic Studies Engineer	CIP Project Manager	
Design	Plan Review (CIP)	ITS Review (CIP)	PW/ Engineering	ITS Specialist	ITS Engineer	ITS Network Engineer	CIP Project Manager	
Design	Plan Review (CIP)	Construction Impacts (CIP)	PW/ Engineering	Traffic Engineering Specialist	Asst. Traffic Engineer	Traffic Studies Engineer	CIP Project Manager	
Design	Plan Review (CIP)	TTC Review (CIP)	Development Services	Engineering Inspector		Traffic Studies Engineer	CIP Project Manager	PW/ Engineering
Design	Plan Review (CIP)	ADA Review (CIP Signal Projects)	PW/ Engineering	Traffic Engineering Specialist	Asst. Traffic Engineer	Signals Supervisor	CIP Project Manager	
Design	Plan Review (CIP)	ADA Review (CIP Non-Signal Projects)	Development Services	Senior Development Engineer				PW/ Engineering
Design	Plan Review (Development)	Operational Traffic Review (DevServ)	PW/ Engineering	Traffic Studies Engineer	Asst. Traffic Engineer	ITS Analyst	Traffic Engineer	DevServ
Design	Plan Review (Development)	Signing/Striping Review (DevServ)	PW/ Engineering	Traffic Engineering Specialist	Asst. Traffic Engineer	Traffic Safety Specialist	Traffic Engineer	DevServ
Design	Plan Review (Development)	Traffic Signal Review (DevServ)	PW/ Engineering	Signal Supervisor	Traffic Engineer	Traffic Studies Engineer		DevServ
Design	Plan Review (Development)	ITS Review (DevServ)	PW/ Engineering	ITS Specialist	ITS Engineer	ITS Network Engineer	Traffic Engineer	DevServ
Design	Plan Review (Development)	Construction Impacts (DevServ)	PW/ Engineering	Traffic Engineering Specialist	Asst. Traffic Engineer	Traffic Studies Engineer		DevServ
Design	Plan Review (Development)	TTC Review (DevServ)	Development Services	Engineering Inspector		Traffic Studies Engineer		PW/ Engineering
Design	Plan Review (Development)	ADA Review (DevServ Signal Projects)	PW/ Engineering	Traffic Engineering Specialist	Asst. Traffic Engineer	Signals Supervisor		DevServ

TSMO Function	Scope	Details	Town Department/s	Staff Position Responsible	Staff Position Accountable	Staff Position Consulted	Staff Position Informed	Liaison With
Design	Plan Review (Development)	ADA Review (DevServ Non-Signal Projects)	Development Services	Senior Development Engineer				PW/ Engineering
Construction	Verification	Plan Verification	PW/ Engineering	None (Third Party Contractor)	Engineering Inspector		CIP Project Manager	
Construction	Traffic Control	TTC Inspection	Development Services	TTC and Signing/Striping Inspectors		Engineering Inspector		PW/ Engineering
Construction	Traffic Control	TTC Public Notification	PW/ Engineering	Public Works PIO	Town Engineer	TTC & Signing/Striping Inspectors	ITS Engineer	DevServ
Construction	Traffic Control	Identify TOC Coordination Need	Development Services	Engineering Inspector		ITS Analyst	ITS Engineer	PW/ Engineering
Construction	Traffic Control	TOC Coordination	PW/ Engineering	None (Contractor Staff)	Engineering Inspector	ITS Analyst		
Construction	Inspection	Construction Review Coordination	Development Services	Engineering Inspector		Signals Supervisor		PW/ Engineering
Construction	Inspection	Signing/Striping Inspection	Development Services	TTC and Signing/Striping Inspectors		Engineering Inspector		PW/ Engineering
Construction	Inspection	Traffic Signal and ADA Inspection	PW/ Engineering	Traffic Signal Specialist	Signals Supervisor	Traffic Engineering Specialist	ITS Engineer	
Construction	Inspection	ITS Inspection (Signal Equipment)	PW/ Engineering	Traffic Signal Specialist	Signals Supervisor	Traffic Engineering Specialist	ITS Engineer	
Construction	Inspection	ITS Inspection (Communications Equipment)	PW/ Engineering	ITS Specialist	ITS Engineer	ITS Network Engineer	Signals Supervisor	
Construction	Inspection	ITS Inspection (Non-Signal Equipment)	PW/ Engineering	Traffic Signal Specialist	Signals Supervisor	ITS Specialist	ITS Engineer	
Construction	Inspection	Utility Inspection (Power)	PW/ Engineering	Signals Supervisor	Traffic Engineer	Traffic Signal Specialist	ITS Engineer	
Construction	Inspection	ADA Inspection (Non-Traffic Signal)	Development Services	Engineering Inspector		Traffic Safety Specialist		PW/ Engineering
Operations	Operational Traffic Analysis	Intersection LOS (Specific Issues)	PW/ Engineering	Traffic Studies Engineer	Asst. Traffic Engineer	ITS Analyst	ITS Engineer	
Operations	Operational Traffic Analysis	ATSPM Analysis	PW/ Engineering	Traffic Studies Engineer	Asst. Traffic Engineer	ITS Analyst	ITS Engineer	
Operations	Operational Traffic Analysis	Safety Analysis (Countermeasures)	PW/ Engineering	Traffic Safety Specialist	Asst. Traffic Engineer	Traffic Studies Engineer	ITS Engineer	

TSMO Function	Scope	Details	Town Department/s	Staff Position Responsible	Staff Position Accountable	Staff Position Consulted	Staff Position Informed	Liaison With
Operations	Operational Traffic Analysis	Access Management	PW/ Engineering	Traffic Engineering Specialist	Asst. Traffic Engineer	Traffic Studies Engineer	Traffic Engineer	
Operations	Operational Traffic Analysis	Bicycle/Pedestrian Evaluations	PW/ Engineering	Traffic Studies Engineer	Asst. Traffic Engineer	Traffic Safety Specialist	Traffic Engineer	DevServ
Operations	Traffic Operations Center	ITS Software Management	PW/ Engineering	ITS Network Engineer	ITS Engineer	ITS Specialist	Signals Supervisor	Information Technology
Operations	Traffic Operations Center	ITS Network Hardware Management	PW/ Engineering	ITS Network Engineer	ITS Engineer	ITS Specialist	Signals Supervisor	Information Technology
Operations	Traffic Operations Center	ITS Security/Firewall	PW/ Engineering	ITS Network Engineer	ITS Engineer	ITS Specialist		Information Technology
Operations	Traffic Operations Center	Incident Tracking	PW/ Engineering	ITS Analyst	ITS Engineer		Traffic Safety Specialist	Police/Fire
Operations	Traffic Operations Center	Police/Fire Coordination (TIM)	PW/ Engineering	ITS Engineer	Traffic Engineer	Asst. Traffic Engineer	Town Engineer	Police/Fire
Operations	Traffic Operations Center	PTZ Camera Control	PW/ Engineering	ITS Analyst	ITS Engineer			Police/Fire
Operations	Traffic Operations Center	Traffic Signal Changes (Real-time)	PW/ Engineering	ITS Analyst	ITS Engineer	Traffic Studies Engineer	Signals Supervisor	
Operations	Traffic Operations Center	Construction Activity Coordination	PW/ Engineering	ITS Specialist	ITS Engineer	Traffic Engineering Specialist	Traffic Engineer	CIP/ DevServ
Operations	Traffic Operations Center	Incident Coordination	PW/ Engineering	ITS Engineer	Traffic Engineer	Asst. Traffic Engineer	Town Engineer	Police PIO/Digital Media PIO
Operations	Traffic Operations Center	Regional Involvement	PW/ Engineering	ITS Engineer	Traffic Engineer	Asst. Traffic Engineer	Town Engineer	
Operations	Traffic Signal Timing	Synchro/TranSync Network Updates	PW/ Engineering	ITS Analyst	ITS Engineer	Traffic Studies Engineer	Traffic Engineer	
Operations	Traffic Signal Timing	ATSPM Adjustments	PW/ Engineering	ITS Analyst	ITS Engineer	Traffic Studies Engineer	Signals Supervisor	
Operations	Traffic Signal Timing	Signal Timing Plan Development	PW/ Engineering	ITS Analyst	ITS Engineer	Traffic Studies Engineer	Signals Supervisor	
Operations	Traffic Signal Timing	Signal Timing Plan Implementation	PW/ Engineering	ITS Analyst	ITS Engineer	Traffic Signal Specialist	Signals Supervisor	
Operations	Traffic Signal Timing	Signal Timing Evaluation	PW/ Engineering	ITS Analyst	ITS Engineer	Traffic Studies Engineer	Signals Supervisor	

TSMO Function	Scope	Details	Town Department/s	Staff Position Responsible	Staff Position Accountable	Staff Position Consulted	Staff Position Informed	Liaison With
Operations	Data Requests	Crash Record Requests	PW/ Engineering	Traffic Safety Specialist	Asst. Traffic Engineer			
Operations	Public Complaints	Receipt of Complaints	PW/ Engineering	Traffic Safety Specialist	Asst. Traffic Engineer	ITS Engineer	Traffic Engineer	Public Works PIO
Operations	Public Complaints	Complaint Tracking	PW/ Engineering	Traffic Safety Specialist	Asst. Traffic Engineer	ITS Engineer	Traffic Engineer	Public Works PIO
Operations	Public Complaints	Complaint Response (Signal Timing)	PW/ Engineering	ITS Analyst	ITS Engineer	Traffic Studies Engineer	Asst. Traffic Engineer	Public Works PIO
Operations	Public Complaints	Complaint Response (Operations)	PW/ Engineering	ITS Analyst	ITS Engineer	Traffic Studies Engineer	Asst. Traffic Engineer	Public Works PIO
Operations	Public Complaints	Complaint Resolution (Signal Timing)	PW/ Engineering	ITS Engineer	Traffic Engineer	ITS Analyst	Asst. Traffic Engineer	Public Works PIO
Operations	Public Complaints	Complaint Resolution (Operations)	PW/ Engineering	ITS Engineer	Traffic Engineer	ITS Analyst	Asst. Traffic Engineer	Public Works PIO
Operations	Public Complaints	Complaint Closure	PW/ Engineering	Traffic Safety Specialist	Asst. Traffic Engineer	ITS Engineer	Traffic Engineer	Public Works PIO
Maintenance	Signing/Striping Maintenance	Initiate Work Order	PW/ Engineering	Traffic Engineering Specialist	Asst. Traffic Engineer	Traffic Safety Specialist	Streets Foreman	Public Works/ Streets
Maintenance	Signing/Striping Maintenance	Signing/Striping Work Orders	PW/Streets	Streets Maintenance Worker	M&O Supervisor	Traffic Studies Engineer	Asst. Traffic Engineer	PW/ Engineering
Maintenance	Traffic Signal Maintenance	Preventive Maintenance (Traffic Signal)	PW/ Engineering	Traffic Signal Specialist	Signals Supervisor		ITS Engineer	
Maintenance	Traffic Signal Maintenance	Emergency Repair (Traffic Signal)	PW/ Engineering	Traffic Signal Specialist	Signals Supervisor		ITS Engineer	
Maintenance	Traffic Signal Maintenance	Detection Health (Traffic Signal)	PW/ Engineering	Traffic Signal Specialist	Signals Supervisor		ITS Engineer	
Maintenance	Traffic Signal Maintenance	EVP Status (Traffic Signal)	PW/ Engineering	Traffic Signal Specialist	Signals Supervisor		ITS Engineer	
Maintenance	Traffic Signal Maintenance	Utility Coordination (Power)	PW/ Engineering	Signals Supervisor	Traffic Engineer	Traffic Signal Specialist	ITS Engineer	
Maintenance	ITS Maintenance	Preventative Maintenance (ITS)	PW/ Engineering	Traffic Signal Specialist	Signals Supervisor	ITS Network Engineer	ITS Engineer	
Maintenance	ITS Maintenance	ITS Communication Links	PW/ Engineering	ITS Specialist	ITS Engineer	ITS Network Engineer	Signals Supervisor	
Maintenance	ITS Maintenance	IP Address Management	PW/ Engineering	ITS Network Engineer	ITS Engineer	ITS Specialist	Signals Supervisor	
Maintenance	ITS Maintenance	PTZ Camera Maintenance	PW/ Engineering	Traffic Signal Specialist	Signals Supervisor	ITS Analyst	ITS Engineer	

TSMO Function	Scope	Details	Town Department/s	Staff Position Responsible	Staff Position Accountable	Staff Position Consulted	Staff Position Informed	Liaison With
Maintenance	ITS Maintenance	DMS Maintenance	PW/ Engineering	Traffic Signal Specialist	Signals Supervisor	ITS Network Engineer	ITS Engineer	
Maintenance	ITS Maintenance	ARID Device Maintenance	PW/ Engineering	Traffic Signal Specialist	Signals Supervisor	ITS Network Engineer	ITS Engineer	
Maintenance	ITS Maintenance	School Zone Flashers/RRFB's	PW/ Engineering	Traffic Signal Specialist	Signals Supervisor		ITS Engineer	

TSMO Functions Evaluation – Summarized by Position (Future)

Red items are recommended roles that are new to a position - either moved from another position or previously not performed by the Town.

Department	Staff Position	Existing Scope	Scale	Proposed Scope
Public Works/ Engineering	Town Engineer	Long-Term ITS/TSMO Planning	Low	
	Traffic Engineer	O&M Cost Estimation	None	Long-Term ITS/TSMO Planning
		Funding Opportunities	Low	Funding Opportunities
		Internal Project Management (as needed)	Med	Needs Assessment/Prioritization
		Lifecycle Analysis (Asset Management)	None	Lifecycle Analysis (Asset Management)
		Operational Traffic Review (CIP)	Med	
	Assist. Traffic Engineer (Supervisory)	Traffic Studies (Internally Developed)	Med	Traffic Studies (Internally Developed)
		Scoping Review (Signals)	Med	Intersection LOS (Town-wide Oversight)
		Needs Assessment/Prioritization	Med	Travel Time/Congestion (Town-wide Oversight)
		Special Projects	Low	Special Projects
		Warrant Analysis (Internally Developed)	Med	Warrant Analysis (Internally Developed)
				ATSPM Review (MARK1)
	Traffic Engineering Specialist	Signing/Striping Review (CIP)	Med	Signing/Striping Review (CIP)
		Traffic Signal Review (CIP)	High	Construction Impacts (CIP)
		Initiate Work Orders	Med	Initiate Work Orders
		Signing/Striping Review (DevServ)	Med	Signing/Striping Review (DevServ)
				Construction Impacts (DevServ)
				ADA Review (CIP Signal Projects)
				ADA Review (DevServ Signal Projects)
				Access Management
	Traffic Studies Engineer			Traffic Count Data
				Operational Traffic Review (CIP)
				Operational Traffic Review (DevServ)
				Intersection LOS (Specific Issues)
				ATSPM Analysis
				Bicycle/Pedestrian Evaluations
	Traffic Safety Specialist			Crash Data Performance Measures
				Safety Analysis (Countermeasures)
				Crash Record Requests
		Receipt of Complaints	Med	Receipt of Complaints
		Complaint Tracking	Med	Complaint Tracking
		Complaint Closure	Med	Complaint Closure
	ITS Engineer	Travel Time/Congestion (Town-wide Oversight)	Low	Scoping Review (Signals)
		Scoping Review (ITS/Fiber)	Med	Scoping Review (ITS/Fiber)
		O&M Cost Estimation	None	

Department	Staff Position	Existing Scope	Scale	Proposed Scope
		Funding Opportunities	Low	
		Internal Project Management (as needed)	Med	Internal Project Management (as needed)
		Lifecycle Analysis (Asset Management)	None	
		Operational Traffic Review (CIP)	Med	
		Traffic Signal Review (CIP)	High	
		Operational Traffic Review (DevServ)	Med	
		Traffic Signal Review (DevServ)	High	
		ITS Review (DevServ)	High	
		Police/Fire Coordination (TIM)	Low	Police/Fire Coordination (TIM)
		Construction Activity Coordination	Med	
		Traffic Signal Changes (Real-time)	Low	
		Incident Coordination	Low	Incident Coordination
		Signal Timing Plan Development	Low	
		Complaint Response/Resolution (Signal Timing)	Med	Complaint Resolution (Signal Timing)
		Receipt of Complaints	Med	
		Complaint Response/Resolution (Operations)	Med	Complaint Resolution (Operations)
		Complaint Closure	Med	
		Regional Involvement	Med	Regional Involvement
	ITS Specialist	ITS/TSMO Inventory and Asset Management	Med	ITS/TSMO Inventory and Asset Management
		ITS Review (CIP)	High	ITS Review (CIP)
		ITS Review (DevServ)	High	ITS Review (DevServ)
		ITS Inspection (Non-Signal Equipment)	High	
		PTZ Camera Control	Med	
		Preventative Maintenance (ITS)	Low	
		ITS Communication Links	High	ITS Communication Links
		IP Address Management	High	Construction Activity Coordination
		PTZ Camera Maintenance	Low	
		ARID Device Maintenance	Low	
		ITS Inspections (Communications Equipment)	Low	ITS Inspections (Communications Equipment)
		ITS Network Hardware Management	Low	
	ITS Analyst	Signing/Striping Review (CIP)	Med	Incident Tracking
		Traffic Signal Review (CIP)	High	PTZ Camera Control
		ITS Review (CIP)	High	Traffic Signal Changes (Real-time)
		ADA Review (CIP Signal Projects)	Low	
		Operational Traffic Review (DevServ)	Med	Synchro/TranSync Network Updates
		Traffic Signal Review (DevServ)	High	ATSPM Adjustments
		ITS Review (DevServ)	High	Signal Timing Plan Development
		ADA Review (DevServ Signal Projects)	Low	Signal Timing Evaluation
		Traffic Signal and ADA Inspection	High	Complaint Response (Signal Timing)
		ITS Inspection (Signal Equipment)	Med	Complaint Response (Operations)

Department	Staff Position	Existing Scope	Scale	Proposed Scope
		ITS Software Management	Low	
		Signal Timing Plan Implementation	Low	Signal Timing Plan Implementation
		Utility Inspection (Power)	Low	
	ITS Network Engineer			ITS Network Hardware Management
				ITS Software Management
				IP Address Management
				ITS Security/Firewall
	Signals Supervisor			Traffic Signal Review (CIP)
				Traffic Signal Review (DevServ)
				Utility Coordination (Power)
				Utility Inspection (Power)
	Traffic Signal Specialists (Signals)			Preventive Maintenance (Traffic Signal)
				Emergency Repair (Traffic Signal)
				Detection Health (Traffic Signal)
				EVP Status (Traffic Signal)
				School Zone Flashers/RRFB's Maintenance
				Traffic Signal and ADA Inspection
				ITS Inspection (Signal Equipment)
	Traffic Signal Specialists (ITS)			Preventative Maintenance (ITS)
				PTZ Camera Maintenance
				DMS Maintenance
				ARID Device Maintenance
				ITS Inspection (Non-Signal Equipment)
	CIP Project Manager	Project Cost Estimation	Med	Project Cost Estimation
				O&M Cost Estimation
		CIP Project Management (>$100K)	High	CIP Project Management (>$100K)
	Public Information Officer	Complaint Tracking	Med	TTC Public Notification
	Digital Gov	Receipt of Complaints	Med	
PW/Streets	Streets Foreman	Initiate Work Orders	Med	
		Complaint Closure	Med	
		Complaint Response (Signal Timing)	Med	
	Traffic Signal Specialists (Field)	Preventive Maintenance (Traffic Signal)	Low	
		Emergency Repair (Traffic Signal)	Med	
		Detection Health (Traffic Signal)	Low	
		EVP Status (Traffic Signal)	Low	
		Utility Coordination (Power)	Med	
		DMS Maintenance	Low	
		School Zone Flashers/RRFB's Maintenance	Low	
	Streets Maintenance Worker	Signing/Striping Work Orders	Med	Signing/Striping Work Orders
Development Services	Transportation Planner	Bicycle/Pedestrian Evaluations	None	

Department	Staff Position	Existing Scope	Scale	Proposed Scope
	Senior Development Engineer	ADA Review (DevServ Non-Signal Projects)	Low	ADA Review (DevServ Non-Signal Projects)
				ADA Review (CIP Non-Signal Projects)
	Engineering Inspectors	Construction Impacts/TTC Review (CIP)	High	TTC Review (CIP)
		Construction Impacts/TTC Review (DevServ)	Med	TTC Review (DevServ)
		Identify TOC Coordination Need	High	Identify TOC Coordination Need
		Construction Activity Coordination	Med	ADA Inspection (Non-Traffic Signal)
		Construction Review Coordination	Med	Construction Review Coordination
	TTC and Signing/Striping Inspection	TTC Inspection	High	TTC Inspection
		Signing/Striping Inspection	High	Signing/Striping Inspection
Not Done		Intersection LOS (Town-wide Oversight)		
		Crash Data Performance Measures		
		Crash Record Requests		
		Traffic Count Data		
		ADA Review (CIP Non-Signal Projects)		
		TTC Public Notification		
		Intersection LOS (Specific Issues)		
		Access Management		
		ATSPM Analysis		
		ATSPM Review (MARK1)		
		ITS Security/Firewall		
		Safety Analysis (Countermeasures)		
		Bicycle/Pedestrian Evaluations		
		Incident Tracking		
		Synchro/TranSync Network Updates		
		ATSPM Adjustments		
		Signal Timing Evaluation		
		ADA Inspection (Non-Traffic Signal)		

Appendix H – Recommended Transportation Performance Metrics

Safety Performance Metrics

Target	Measurement	Collection Method	Calculations
Arizona has a goal to decrease 3-7% of fatalities and serious injury incidents every 5 years to coordinate with FHWA zero fatality goal. To assist in this goal decrease the total number of traffic fatalities by 2% each year.	Number of traffic related fatalities and serious injuries annually within the Town of Gilbert. ***could be broken down into location of incident and cause. Ex: downtown, left turn, red light run, intoxicated driver, distracted driver, worker incidents, etc. to keep track of which improvements are having the largest effect. ***City of Peoria uses a citywide crash analysis tool using Microsoft BI	• Gather traffic incident data from Gilbert Police Department. • Separate motorized and non-motorized incidents.	• $\%change = \frac{New-Old}{Old} X100$ • Fatality Rate-number of persons killed in motor vehicle crashes per 100 MVMT for a calendar year • Serious injury rate-number of persons seriously injured in motor vehicle crashes per 100 MVMT for a calendar year • Non-motorized fatalities and serious injury-number of pedestrian and bicyclist fatalities and serious injuries for a calendar year
Increase all school zone safety rankings to A.	Number of traffic events within the school area per trip crossed through the school area.	• https://zendrive.com/school-safety-2018/ • Zendrive provides data on school zone safety throughout the country for 2017 and 2018 • Traffic Counter/detection/CCTV?	If recent data is unavailable it is suggested to use traffic counters and PD data to calculate the new safety ranking using the same methodology.
Reduce travel time for police vehicles along a corridor	Median and Change in travel time for police vehicles along a corridor.	• Police AVL Devices • Incident location and start time	• Travel time in minutes=[(distance traveled from point A to point B)/(speed of police vehicle)]x60 • Number of minutes change in travel time=(new travel time along corridor)-(old travel time along corridor) • Percent change in travel time=[(new travel time along corridor)/(old travel time along corridor)]-1X100 • Travel time segments may need to be added together to full corridor travel time.

Mobility Performance Metrics

Target	Measurement	Collection Method	Calculations
Improve all roadways to LOS D or better	Median and change in travel time along corridors	• Anonymous detection device: anonymous ID location and time measured at various times of day and days of week	• Travel time in minutes=[(distance traveled from point A to point B)/ (speed of transit vehicle)] X 60 • (ID location at point A-ID location at point B)=[(travel distance)/(average speed along corridor)] X 60 • % change in travel time=[(new travel time along corridor)/ (old travel time along corridor)]-1X100
Improve Transit reliability	Travel time for transit along corridor	• Transit AVL • TSP activation timestamp at location (if needed)	• Travel time in minutes=[(distance traveled from point A to point B)/ (speed of transit vehicle)] X 60
Improve incident clearance times	Percent change in incident clearance time	• Incident reports	• {[(Average incident clearance time last year)-(average incident clearance time this year)]/average incident clearance time last year}-1X100
Increase signal timing changes to accommodate for congestion changes	Percent of signal timing changes made as a result of recurring or non-recurring congestion	Central management system controlled by TOC: • Signal change timestamp • Reason for signal timing change Incident reports: • Incident response or congestion initiating of activity	• [(Total number of signal timing changes made)-(number of changes where reason for recording is congestion, an incident, or a planned event including work zones)]/(total number of signal timing changes made for any reason)
Decrease vehicle delay	Percent reduction in vehicle delay duration by intersection and direction	• Detector occupancy and speed • CCTV occupancy and speed	• Detector occupancy=timestamp of beginning of detector/camera occupancy-timestamp of end of detector/camera occupancy • Percent reduction for occupancy=[(detector occupancy for time 2)-(detector occupancy for time 1)]/ (detector occupancy for time 1) • Detector speed=speed of vehicles as detected by detector/camera • Percent reduction for speed=(vehicle speed detected at time 2)-(vehicle speed detected at time 1)/ (vehicle speed detected at time 1)

Target	Measurement	Collection Method	Calculations
Improve congestion in areas of incidents	% congestion reduction during incidents	Mainline arterial and advanced detection devices: • Volume on corridor before and after incident • Volume on adjacent arterials before and after incident • Queue length (CCTV or detection) on corridor • Incident duration	• [(Volume on corridor 10 minutes after incident start time)-(volume on corridor before time of incident)]/(volume on corridor before time of incident)=increased percent of volume due to incident along main corridor where incident occurred • [(Volume on adjacent arterials summed together 10 minutes after incident start time)-(volume on adjacent arterials summed together before time of incident)]/(volume on adjacent arterials summed together before time of incident)=increase percent of volume on adjacent arterials due to detouring traffic away from incident
• The City of Phoenix uses regional map provided by ARID provider, Acyclica, to view automated travel time reports, delay reports, turning movement counts and speed data. Also use to increase real-time visual capabilities. • The City of Mesa has 5 ATC cabinets which allow for signals to remain in flash while rebuilding the signal cabinet. • ASTPM on Bell Road showed drivers experiencing less delay and fewer number of stop along the route for movements that failures are typically seen. Adaptive System Implementation resulted in an overall average of 16% reduction in travel time along the corridor. • CAD-AVL on Valley Metro: Clever equipment has been installed on 900 buses with the help of VM, Scottsdale, and Phoenix.			

Preservation Performance Metrics

Target	Measurement	Collection Method
All fiber and ITS devices are in full working order. All work orders are filled and completed within a 2-day time frame.	• Number of ITS device failures reported and repaired • % unscheduled repairs completed under 2 days • % uptime • No. of connections to Town infrastructure • No. of devices connected	• Hours of preventative maintenance time • Hours of repair time based on ticket • Install date • Replacement date/update date • Ticket entry date • Ticket completion date
CCTV	Operational functionality	• Status: on/off • Communication/Transmission: success/failure • Image speed: frames per second
DMS	Operational functionality	• Status: on/off • Communication/Transmission: success/failure
Fiber	Operational functionality	• Status: on/off • Communication/Transmission: success/failure • Bandwidth consumption • Timestamp on bandwidth usage
Detection	Operational functionality	• Status: on/off • Communication/Transmission: success/failure
Emergency Vehicle Preemption	Operational functionality	• Status: on/off • Activation timestamp at location
Wireless Radio	Operational functionality	• Status: on/off • Communication/Transmission: success/failure
Transit Priority	Operational functionality	• Status: on/off • Activation timestamp at location
Capacity of Communications accurately logged	• Capacity of communications network (by number of devices and spatial saturation)	• Communications: Success failure (fiber or wireless) • Bandwidth consumption o Create baseline of bandwidth usage currently of particular points in the communications or fiber and wireless networks including the number of devices and the location of those devices relative to the network design as a whole. o Average the bandwidth usage as a percent of total capacity of the network by month o Compare percent of the total capacity of the network month to month throughout year • Timestamp on bandwidth usage
ITS Database 100% operational and accurate	• Total number of each device in system • Total number of devices in system	• [(total number of device type X)-(number of device type with 'off' status)-(number of device with type X with communication failure)]/(total number of device type X)
• The City of Chandler has access to live feeds from every intersection and is implementing thermal technology		

Stewardship Performance Metrics

Target	Measurement	Collection Method	Calculations
Increase in web traffic flow	% increase in number of webpage views of interactive map for public use	• Number of webpage views	• (Number of webpage views of interactive map / total number of webpage views) x100
Increased in social media following for incident reporting	% of incidents attended to using social media	• Number of incidents attended to using social media	• (Number of incidents attended to using social media / number of incidents) x100
Increase action or consideration of action for public	% of public entries that were acted on by Town	• Number of public entries • Number of entries that were attended to • Number of entries not attended to	• (Number of public entries that were acted on by Town / number of public entries) x100
Improve/track project timing	% of projects completed on time	• Total number of projects started/completed • Project completion prediction/goal • Actual project completion	• (Number of projects completed on time / total number of projects) x100
Improve/ track project budgeting	% of projects completed on budget	• Total number of projects completed • Project budget goal • Actual project budget	• (Number of projects completed within budget/total number of projects) X100

Appendix I – Recommended Internal Data Dashboard Options

Attribute	Source	Contents	Details
Signal Log with Map	ATMS	Signal ID	Signal Configuration details: Approach information - Description and Phases Detector Information - ID number, channel, direction, phase, overlap, enabled detection types, detection hardware, latency correction, movement type, lane number, lane type
		Naming	
		Controller Type	
		Description/zoning/grouping	
		Corridor and sub corridor	
		Location (coordinates)	
		Agency	
		Signal Configuration Data	
		Link to Signals Live	Platform that enables view of entire corridor (multi-window)
ITS Network Device Summary	ATMS	Device Inventory	
Log Action Taken	ATMS	Submission Form	Name, date, signal, agency, actions, metric types (possibility to include construction log)
Performance Measurements and Trends (monthly and quarterly basis) can be broken down into corridors or compiled together for trend and comparison analysis	MARK-1	Performance Measurements	Throughput (vehicles per hour - vph) Arrivals on green (%) Progression Ratio (%) Spillback Rate (%) Peak Period Split Failures (%) Off-Peak Split Failures (%) Travel Time Index (%) Planning Time Index (%)
		Volume-Based Measurements	Traffic volume (vpd) Am peak volume (vph) PM peak volume (vph) Pedestrian activations
		Equipment Measurements	Vehicle detector availability (%) Pedestrian Pushbutton availability (%) CCTV availability (%) Communications Uptime (%) Roadside Unit (RSU) Uptime (%)
		Activity Measurements	Tasks reported this month Task resolved this month Tasks outstanding (unresolved) Tasks over 45 days (unresolved) Tasks mean time to resolved
Signal Analysis	ATMS and MARK-1	Purdue Phase Termination	
		Speed limits	
		Speed history	
Statistics	ATMS and MARK-1	AADT	
		K-Factor	
		D-Factor	
		Future AADT	
		Vehicle Classifications	
Resident Satisfaction	Survey Based (Alex)	Town already has survey database, include link or subtab to survey results	

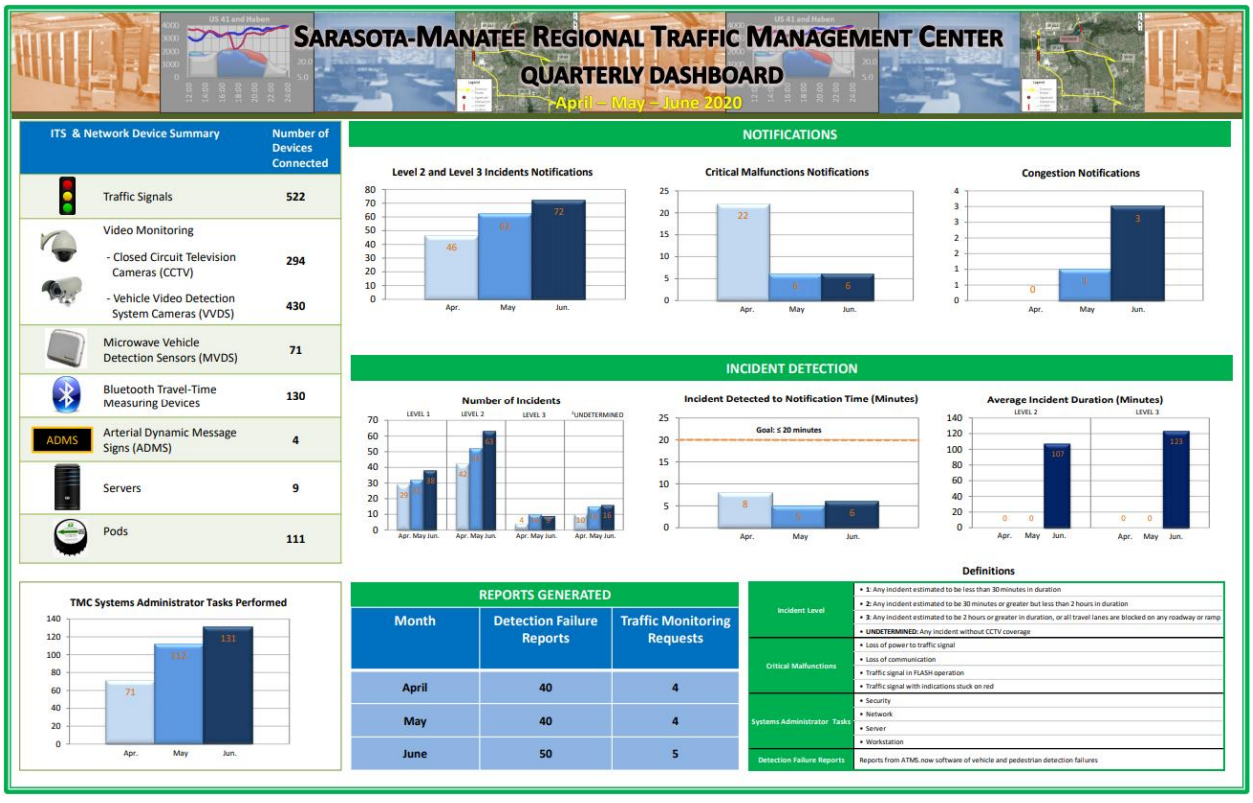
Attribute	Source	Contents	Details
Traffic Restriction Log	ATMS and One Stop Shop	Database of current construction and closures	Opportunity for Town to implement online tracking form for construction management. Same format as Log Action Form.
Watchdog	MARK-1	Color Intensive Alert Tracker and downloadable excel file	No Camera Image Bad vehicle detection Bad push buttons Pedestrian activations Force offs Max outs Counts Missing records
Resource Links	ATMS, MARK-1, Alex	Manuals	
		Go-Bys	
		External Dashboard with monthly and quarterly reports	

Appendix J – Recommended External Data Dashboard Options

Interface Recommendations			
Attribute	Source	Contents	Details
Customizable Dashboard with moveable/expandable sub windows	Google or Waze	Real-time traffic map	Map Layer
	ATMS	Real-time camera map	Map Layer
	One Stop Shop, twitter	Planned event tracker	Widget
	Weather.com	Local weather	Widget
	Twitter, Facebook	Twitter/social media updates	Widget
	ATMS, PD CAD	Real-time incident map	Map Layer
	One Stop Shop	Real-time construction map	Map Layer
	ATMS	Public submission form	Widget
Additional Recommendations			
Attribute	Source	Contents	Details
External Links	Valley Metro	Real-time transit information	Future potential, VM in progress with real-time transit application
	-	AZ 511	
	-	Gilbert 311	
	ATMS/MARK-1	Tutorials	
	Town of Gilbert	Other Town services/entities	Water, trash, street sweeping, PD, fire, CIP maps, area maps, etc.
Quarterly Reports	ATMS	ITS and Network Summary	No. of devices connected
	PD, MARK-1	Incident Notifications Received and Attended to	No. of incidents (level 2 and 3), Incident detection to notification time, average incident duration
	MARK-1	Critical Malfunction Notifications	No. of notifications for loss of power to traffic signal, loss of communication, flash operation, and stuck on red
	ADOT, MARK-1	Congestion Notifications	No. of notifications for nonrecurring congestion
	MARK-1, PD	Incident detection	No. of incidents Incident detection Average incident duration
	MARK-1	TMC administrative tasks performed	
	MARK-1	Reports generated	Detection failure reports and traffic monitoring requests
	-	Definitions	Definitions of ITS language
Annual Reports	MARK-1	Traffic management	Events detected and monitored Timing changes Ped detection failure reports made
	Digital Government	Technology advancements	Websites, software, social media, network upgrades, etc.
	Town of Gilbert	Regional Support	Supporting projects
	US Census	Population projections	

Additional Recommendations			
Attribute	Source	Contents	Details
Annual Reports	MARK-1	Performance	Incident related timing changes Vehicle delay savings (time) Vehicle delay savings ($) Throughput during incidents Critical malfunctions detected, reported, and monitored Incidents detected and their levels (clearance time)
	Digital Government	Traveler Information	Dashboard users Dashboard views Twitter followers
	MARK-1	Summation of projects and descriptions	Current connections: Signals, fiber, CCTV, video detection, microwave detection, Bluetooth travel time devices, ATMS, HUB switches, field ethernet switches
	Town of Gilbert	Summation of project goals and objectives	Include any recognitions/awards

Quarterly Summary Example



Annual Summary Example

TRAFFIC MANAGEMENT

- 1,522 incidents and 712 congestion events detected and monitored
- 259 incident and congestion events managed with signal timing changes needed and implemented
- More than 400 Vehicle and Pedestrian Detector Failure reports generated
- Generated and distributed RTMC Quarterly Dashboards to FDOT and the RTMC Stakeholders

TECHNOLOGY ADVANCEMENT

- Launched the RTMC Traveler Information website SMART TRAFFIC
- Upgraded all RTMC software to latest versions
- Launched the RTMC Twitter account @941_traffic
- Replaced Manatee County network HUB switches

REGIONAL SUPPORT

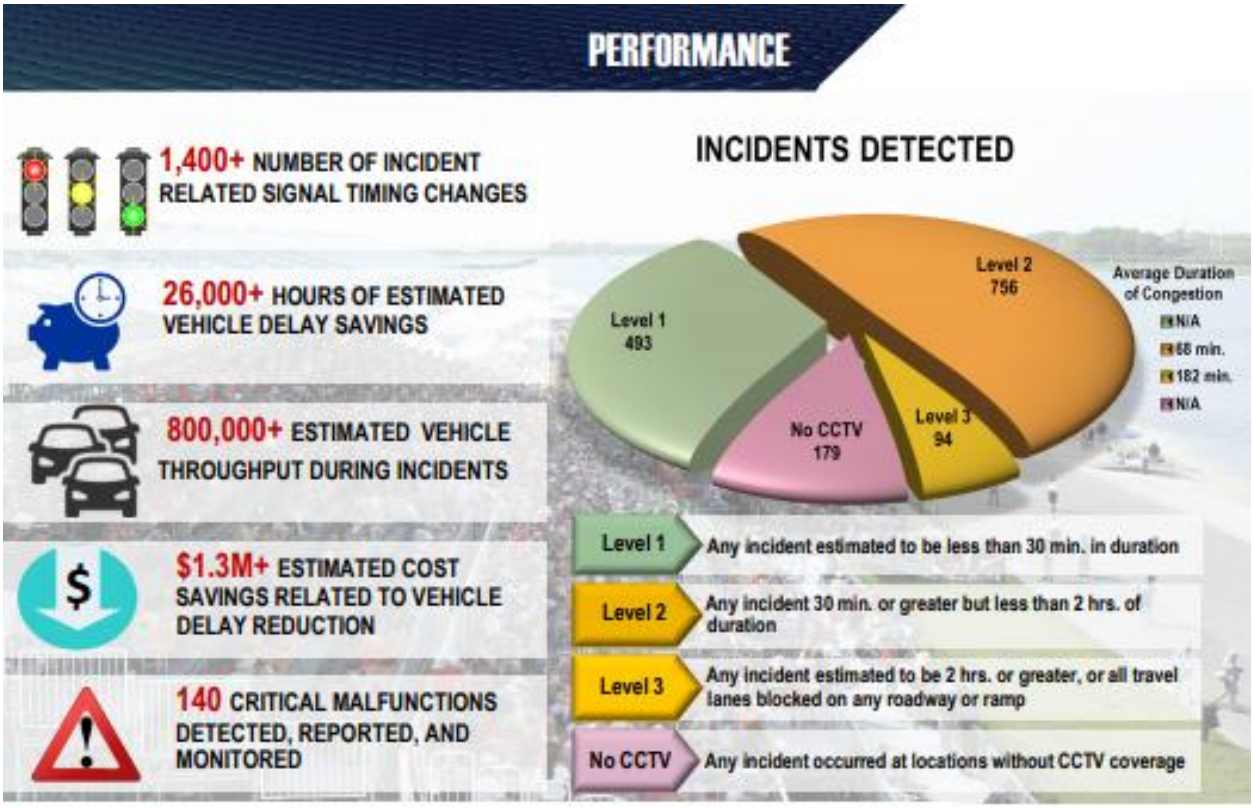
- Planned special event activation during *Riverwalk Regatta*
- Assisted in finalizing Sarasota-Manatee ATMS Master Plan Update document
- Assisted with implementation of SR 70 *SynchroGreen Adaptive Traffic Control System* - Manatee County
- Assisted with implementation of *44th Avenue Extension* project - Manatee County
- Assisted with implementation of *Ft. Hamer Bridge* project - Manatee County
- Assisted with planning of *ATMS Expansion* project - Manatee County
- Assisted with implementation of *ATMS Phase 5* project - Sarasota County
- Assisted with implementation of *Diversion and Evacuation Routes Timing* - Sarasota County
- Regular participation in FDOT's Traffic Incident Management (TIM) TEAM efforts

The Advanced Traffic Management System (ATMS) integrates technology to improve traffic mobility, efficiency, and safety.

Projected Population Growth

POPULATION 1990		POPULATION 2016		POPULATION 2045
Manatee 216,563		Manatee 357,591		Manatee 550,800
Sarasota 279,748		Sarasota 399,538		Sarasota 522,600

Information provided by the Sarasota-Manatee MPO


PERFORMANCE
1,400+ NUMBER OF INCIDENT RELATED SIGNAL TIMING CHANGES
26,000+ HOURS OF ESTIMATED VEHICLE DELAY SAVINGS
800,000+ ESTIMATED VEHICLE THROUGHPUT DURING INCIDENTS
$1.3M+ ESTIMATED COST SAVINGS RELATED TO VEHICLE DELAY REDUCTION
140 CRITICAL MALFUNCTIONS DETECTED, REPORTED, AND MONITORED
INCIDENTS DETECTED
Level 1 493
Level 2 756
Level 3 94
No CCTV 179
Average Duration of Congestion
N/A
68 min.
182 min.
N/A
Level 1 Any incident estimated to be less than 30 min. in duration
Level 2 Any incident 30 min. or greater but less than 2 hrs. of duration
Level 3 Any incident estimated to be 2 hrs. or greater, or all travel lanes blocked on any roadway or ramp
No CCTV Any incident occurred at locations without CCTV coverage


TRAVELER INFORMATION
# of website users: 17,000+
# of website views: 34,000+
Twitter Followers: 241
SMARTTRAFFIC
Website views by Country
www.smarttrafficinfo.org provides access to live video feeds from 350+ traffic cameras within Manatee and Sarasota Counties!

Who we are

In May 2005, the Florida Department of Transportation (FDOT), Manatee County, Sarasota County, the City of Sarasota, and the City of Bradenton entered into an Interlocal Agreement for cooperation and coordination in the operation of a Unified Intelligent Transportation Management System. The agreement provides that each party would bear a proportional share of the ongoing operational costs of the Regional Traffic Management Center.

The Sarasota-Manatee RTMC efficiently and effectively coordinates with the FDOT's South West Interagency Facility for Transportation (SWIFT) SunGuide Center (Fort Myers Main Office) through the satellite center located within the RTMC facility. Thanks to a state-of-the art communication network, provided by several hundreds of miles of single-mode fiber optics cable deployed throughout the Sarasota-Manatee geographical area, the RTMC is currently connected to:

- 509 Traffic signals
- 275+ Miles of fiber optic cable
- 252 Closed Circuit Television Cameras (CCTV)
- 349 Vehicle Video Detection Cameras
- 64 Microwave based vehicle detection devices
- 114 Bluetooth Travel-Time measuring devices
- 4 Arterial Dynamic Message Signs (ADMS)
- 19 Servers
- 12 Layer 3 HUB Switches
- 578 Managed Field Ethernet Switches

ite TBITE Project of the Year 2013

ASCE Project of the Year 2012

ITS Florida Outstanding Achievement Award 2013, 2014

What we do

Under the direction of its regional stakeholders, the RTMC serves as the centralized hub of activity for operation, maintenance and monitoring of the various bi-countywide deployment of the Advanced Traffic Management Systems (ATMS). The RTMC staff uses these tools to efficiently manage all network-connected devices and their communication, and to monitor the traffic conditions of the arterial roadway system and promptly make any necessary temporary traffic signal timing adjustments during incidents to help reduce the duration of congestion.

Real-Time	Reduce	Increase	Improve	Improve	Analysis	Real/Time
Incident Management	Congestion across multiple jurisdictions	Evacuation/ recovery efforts	Special/ planned event traffic management	Maintenance/ repair response times	Data collection/ engineering	Traveler information dissemination

OUR MISSION

The Sarasota-Manatee Regional Traffic Management Center will provide an enabling environment for all stakeholders to collaborate and share information resulting in a combined, systemic approach to traffic operations and traffic incident response

2101 47th Terrace East, Bradenton, FL 34203
(941) 744-3980
@941_traffic
SMARTTRAFFIC
www.smarttrafficinfo.org

Appendix K – TSMO Involvement Calendar

Legend: Funding Regional Meetings Internal Meetings Activities

January							
Section	Item	Time	Frequency	Notes	Purpose	Initiator	Participants
General	CIP Process - Submit Proposals for new or updated services	-	Dec-Jan	Annually	Funding process	Gilbert Budget/Research	Town Engineer/Town Traffic Engineer
	TOC Staff Meeting	-	-	Weekly	Planning and coordination	TOC	Town TOC Staff
	Traffic Staff Meeting	-	-	Weekly	Planning and coordination	Town Traffic Engineer	Town Engineering Staff/TOC Staff
	Planning Meeting	2:00	Tuesdays	Weekly	Planning and coordination	Town Engineer	Town Transportation Planning Staff
	Update/Review SOP's	-	-	Quarterly	Keep SOP's up-to-date	Town Traffic Engineer	
1st	MAG Transit Committee Meeting	10-12	1st Mon	Monthly	Region involvement	MAG	Town Transportation Planning Staff
	Town Council Meeting	6:30	1st Tues	Twice Per Month	Planning and coordination	Town Council	Town Councilmembers and Other Staff
	MAG ITS Committee Meeting	10-12	1st Wed	Monthly	Region involvement	MAG	Town ITS Engineer
	Second in Command Meeting		1st Thurs	Monthly	Planning and coordination	Town Manager	Town Traffic Engineer
2nd	AZTech TIM Coalition Meeting	10-12	2nd Tues	Every Other Month	Region involvement	MCDOT	Town Police and Fire Staff
	Executive Team Meeting	-	2nd Tues	Every Other Month	Interdepartmental coordination	Town Manager	Town Engineer
	TOC Meets with Signals Tech	-	-	Monthly	Planning and coordination	Town Traffic Engineer	Traffic Signal Specialists
	Supervisors Meeting	-	2nd Thurs	Monthly	Interdepartmental coordination	Town Manager	All Supervisors
	Public Works Meeting	-	-	Monthly	Interdepartmental coordination	Public Works Director	Public Works Staff
3rd	MAG Active Transportation Committee Meeting	1-3	3rd Tues	Monthly	Region involvement	MAG	Town Transportation Planning Staff
	Town Council Meeting	6:30	3rd Tues	Twice Per Month	Planning and coordination	Town Council	Town Councilmembers and Other Staff
	AZTech Operations Committee Meeting	9-11	3rd Wed	Monthly	Region involvement	MCDOT	Town ITS Engineer
	AZTech Strategic Steering Committee Meeting	2-4	3rd Thurs	Monthly	Region involvement	MCDOT	Town Traffic Engineer
4th	MAG Transportation Safety Committee Meeting	9-11	4th Tues	Monthly	Region involvement	MAG	Town Traffic Engineer
	CIP Meeting with Traffic/TOC	-	-	Monthly	Interdepartmental coordination	Town Traffic Engineer	CIP and TOC Staff
	Fire/PD/Traffic Meeting	-	-	Quarterly	Interdepartmental coordination	Town Traffic Engineer	Fire and PD Staff
	Development Service/Traffic Meeting	-	-	Quarterly	Interdepartmental coordination	Town Traffic Engineer	Development Services Staff
	Traffic/TOC Meeting with IT	-	-	Quarterly	Interdepartmental coordination	Town Traffic Engineer	Information Technology and TOC Staff

February							
Section	Item	Time	Frequency	Notes	Purpose	Initiator	Participants
General	CIP Process - public review of budget reports	-	Feb	Annually	Funding Process	Gilbert Budget/Research	Town Engineer/Town Traffic Engineer
	TOC Staff Meeting	-	-	Weekly	Planning and coordination	TOC	Town TOC Staff
	Traffic Staff Meeting	-	-	Weekly	Planning and coordination	Town Traffic Engineer	Town Engineering Staff/TOC Staff
	Planning Meeting	2:00	Tuesdays	Weekly	Planning and coordination	Town Engineer	Town Transportation Planning Staff
1st	MAG Transit Committee Meeting	10-12	1st Mon	Monthly	Region involvement	MAG	Town Transportation Planning Staff
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4th	MAG TIP Process - projects in Draft TIP	-	Last week	Annually	Funding Process	MAG	Town Traffic Engineer/ITS Engineer
	MAG Transportation Safety Committee Meeting	9-11	4th Tues	Monthly	Region involvement	MAG	Town Traffic Engineer
	CIP Meeting with Traffic/TOC	-	-	Monthly	Interdepartmental coordination	Town Traffic Engineer	CIP and TOC Staff

March							
Section	Item	Time	Frequency	Notes	Purpose	Initiator	Participants
General	TOC Staff Meeting	-	-	Weekly	Planning and coordination	TOC	Town TOC Staff
	Traffic Staff Meeting	-	-	Weekly	Planning and coordination	Town Traffic Engineer	Town Engineering Staff/TOC Staff
	Planning Meeting	2:00	Tuesdays	Weekly	Planning and coordination	Town Engineer	Town Transportation Planning Staff
	Identify Training Requests- Fiscal	-	-	Annually	Identify training needs and its funding	Town Traffic Engineer	
	Identify Staffing Requests	-	-	Annually	Identify staffing needs and its funding	Town Traffic Engineer	
	Review Maps for Updates	-	-	Annually	Keep maps up-to-date	Town Traffic Engineer	
	Research Competitive Grants	-	-	Twice Per Year	Funding and Project Planning	Gilbert Budget/Research	
1st	MAG Transit Committee Meeting	10-12	1st Mon	Monthly	Region involvement	MAG	Town Transportation Planning Staff
	Town Council Meeting	6:30	1st Tues	Twice Per Month	Planning and coordination	Town Council	Town Councilmembers and Other Staff
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4th	MAG Transportation Safety Committee Meeting	9-11	4th Tues	Monthly	Region involvement	MAG	Town Traffic Engineer
	CIP Meeting with Traffic/TOC	-	-	Monthly	Interdepartmental coordination	Town Traffic Engineer	CIP and TOC Staff

April							
Section	**Item**	**Time**	**Frequency**	**Notes**	**Purpose**	**Initiator**	**Participants**
General	TOC Staff Meeting	-	-	Weekly	Planning and coordination	TOC	Town TOC Staff
	Traffic Staff Meeting	-	-	Weekly	Planning and coordination	Town Traffic Engineer	Town Engineering Staff/TOC Staff
	Planning Meeting	2:00	Tuesdays	Weekly	Planning and coordination	Town Engineer	Town Transportation Planning Staff
	Update/Review SOP's	-	-	Quarterly	Keep SOP's up-to-date	Town Traffic Engineer	
	Schedule Vendor Demos	-	-	Annually	Learn of new best practices and invite others	Town Traffic Engineer	
1st	MAG Transit Committee Meeting	10-12	1st Mon	Monthly	Region involvement	MAG	Town Transportation Planning Staff
	Town Council Meeting	6:30	1st Tues	Twice Per Month	Planning and coordination	Town Council	Town Councilmembers and Other Staff
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	CIP Meeting with Traffic/TOC	-	-	Monthly	Interdepartmental coordination	Town Traffic Engineer	CIP and TOC Staff
	Fire/PD/Traffic Meeting	-	-	Quarterly	Interdepartmental coordination	Town Traffic Engineer	Fire and PD Staff
	Development Service/Traffic Meeting	-	-	Quarterly	Interdepartmental coordination	Town Traffic Engineer	Development Services Staff
	Traffic/TOC Meeting with IT	-	-	Quarterly	Interdepartmental coordination	Town Traffic Engineer	Information Technology and TOC Staff

May							
Section	Item	Time	Frequency	Notes	Purpose	Initiator	Participants
General	CIP Process - Town Manager presents revised budget	-	May	Annually	Funding process	Gilbert Budget/Research	Town Engineer/Town Traffic Engineer
	TOC Staff Meeting	-	-	Weekly	Planning and coordination	TOC	Town TOC Staff
	Traffic Staff Meeting	-	-	Weekly	Planning and coordination	Town Traffic Engineer	Town Engineering Staff/TOC Staff
	Planning Meeting	2:00	Tuesdays	Weekly	Planning and coordination	Town Engineer	Town Transportation Planning Staff
	Review TSMO Documents and Tools	-	-	Annually	Keep TSMO up-to-date	Town Traffic Engineer	
1st	MAG Transit Committee Meeting	10-12	1st Mon	Monthly	Region involvement	MAG	Town Transportation Planning Staff
	Town Council Meeting	6:30	1st Tues	Twice Per Month	Planning and coordination	Town Council	Town Councilmembers and Other Staff
	MAG ITS Committee Meeting	10-12	1st Wed	Monthly	Region involvement	MAG	Town ITS Engineer
	Second in Command Meeting	-	1st Thurs	Monthly	Planning and coordination	Town Manager	Town Traffic Engineer
2nd	AZTech TIM Coalition Meeting	10-12	2nd Tues	Every Other Month	Region involvement	MCDOT	Town Police and Fire Staff
	Executive Team Meeting	-	2nd Tues	Every Other Month	Interdepartmental coordination	Town Manager	Town Engineer
	TOC Meets with Signals Tech	-	-	Monthly	Planning and coordination	Town Traffic Engineer	Traffic Signal Specialists
	Supervisors Meeting	-	2nd Thurs	Monthly	Interdepartmental coordination	Town Manager	All Supervisors
	Public Works Meeting	-	-	Monthly	Interdepartmental coordination	Public Works Director	Public Works Staff
3rd	MAG Active Transportation Committee Meeting	1-3	3rd Tues	Monthly	Region involvement	MAG	Town Transportation Planning Staff
	Town Council Meeting	6:30	3rd Tues	Twice Per Month	Planning and coordination	Town Council	Town Councilmembers and Other Staff
	AZTech Operations Committee Meeting	9-11	3rd Wed	Monthly	Region involvement	MCDOT	Town ITS Engineer
	AZTech Strategic Steering Committee Meeting	2-4	3rd Thurs	Monthly	Region involvement	MCDOT	Town Traffic Engineer
4th	MAG Transportation Safety Committee Meeting	9-11	4th Tues	Monthly	Region Involvement	MAG	Town Traffic Engineer
	CIP Meeting with Traffic/TOC	-	-	Monthly	Interdepartmental coordination	Town Traffic Engineer	CIP and TOC Staff

June							
Section	Item	Time	Frequency	Notes	Purpose	Initiator	Participants
General	CIP Process - formal adoption of town budget	-	May	Annually	Funding process	Gilbert Budget/Research	Town Engineer/Town Traffic Engineer
	TOC Staff Meeting	-	-	Weekly	Planning and coordination	TOC	Town TOC Staff
	Traffic Staff Meeting	-	-	Weekly	Planning and coordination	Town Traffic Engineer	Town Engineering Staff/TOC Staff
	Planning Meeting	2:00	Tuesdays	Weekly	Planning and coordination	Town Engineer	Town Transportation Planning Staff
1st	MAG Transit Committee Meeting	10-12	1st Mon	Monthly	Region involvement	MAG	Town Transportation Planning Staff
	Town Council Meeting	6:30	1st Tues	Twice Per Month	Planning and coordination	Town Council	Town Councilmembers and Other Staff
	MAG ITS Committee Meeting	10-12	1st Wed	Monthly	Region involvement	MAG	Town ITS Engineer
	Second in Command Meeting	-	1st Thurs	Monthly	Planning and coordination	Town Manager	Town Traffic Engineer
2nd	TOC Meets with Signals Tech	-	-	Monthly	Planning and coordination	Town Traffic Engineer	Traffic Signal Specialists
	Supervisors Meeting	-	2nd Thurs	Monthly	Interdepartmental coordination	Town Manager	All Supervisors
	Public Works Meeting	-	-	Monthly	Interdepartmental coordination	Public Works Director	Public Works Staff
3rd	MAG Active Transportation Committee Meeting	1-3	3rd Tues	Monthly	Region involvement	MAG	Town Transportation Planning Staff
	Town Council Meeting	6:30	3rd Tues	Twice Per Month	Planning and coordination	Town Council	Town Councilmembers and Other Staff
	AZTech Operations Committee Meeting	9-11	3rd Wed	Monthly	Region involvement	MCDOT	Town ITS Engineer
	AZTech Strategic Steering Committee Meeting	2-4	3rd Thurs	Monthly	Region involvement	MCDOT	Town Traffic Engineer
4th	MAG Transportation Safety Committee Meeting	9-11	4th Tues	Monthly	Region involvement	MAG	Town Traffic Engineer
	CIP Meeting with Traffic/TOC	-	-	Monthly	Interdepartmental coordination	Town Traffic Engineer	CIP and TOC Staff

July							
Section	Item	Time	Frequency	Notes	Purpose	Initiator	Participants
General	TOC Staff Meeting	-	-	Weekly	Planning and coordination	TOC	Town TOC Staff
	Traffic Staff Meeting	-	-	Weekly	Planning and coordination	Town Traffic Engineer	Town Engineering Staff/TOC Staff
	Planning Meeting	2:00	Tuesdays	Weekly	Planning and coordination	Town Engineer	Town Transportation Planning Staff
	Update/Review SOP's	-	-	Quarterly	Keep SOP's up-to-date	Town Traffic Engineer	
1st	CIP Process - Town budget is available	-	1st week	Annually	Funding process	Gilbert Budget/Research	Town Engineer/Town Traffic Engineer
	MAG TIP Process - TIP budget and closeout funding available	-	1st week	Annually	Funding process	MAG	Town Traffic Engineer/ITS Engineer
	MAG Transit Committee Meeting	10-12	1st Mon	Monthly	Region involvement	MAG	Town Transportation Planning Staff
	Town Council Meeting	6:30	1st Tues	Twice Per Month	Planning and coordination	Town Council	Town Councilmembers and Other Staff
	MAG ITS Committee Meeting	10-12	1st Wed	Monthly	Region involvement	MAG	Town ITS Engineer
	Second in Command Meeting	-	1st Thurs	Monthly	Planning and coordination	Town Manager	Town Traffic Engineer
2nd	AZTech TIM Coalition Meeting	10-12	2nd Tues	Every Other Month	Region involvement	MCDOT	Town Police and Fire Staff
	Executive Team Meeting	-	2nd Tues	Every Other Month	Interdepartmental coordination	Town Manager	Town Engineer
	TOC Meets with Signals Tech	-	-	Monthly	Planning and coordination	Town Traffic Engineer	Traffic Signal Specialists
	Supervisors Meeting	-	2nd Thurs	Monthly	Interdepartmental coordination	Town Manager	All Supervisors
	Public Works Meeting	-	-	Monthly	Interdepartmental coordination	Public Works Director	Public Works Staff
3rd	MAG Active Transportation Committee Meeting	1-3	3rd Tues	Monthly	Region involvement	MAG	Town Transportation Planning Staff
	Town Council Meeting	6:30	3rd Tues	Twice Per Month	Planning and coordination	Town Council	Town Councilmembers and Other Staff
	AZTech Operations Committee Meeting	9-11	3rd Wed	Monthly	Region involvement	MCDOT	Town ITS Engineer
	AZTech Strategic Steering Committee Meeting	2-4	3rd Thurs	Monthly	Region involvement	MCDOT	Town Traffic Engineer
4th	MAG Transportation Safety Committee Meeting	9-11	4th Tues	Monthly	Region involvement	MAG	Town Traffic Engineer
	CIP Meeting with Traffic/TOC	-	-	Monthly	Interdepartmental coordination	Town Traffic Engineer	CIP and TOC Staff
	Fire/PD/Traffic Meeting	-	-	Quarterly	Interdepartmental coordination	Town Traffic Engineer	Fire and PD Staff
	Development Service/Traffic Meeting	-	-	Quarterly	Interdepartmental coordination	Town Traffic Engineer	Development Services Staff
	Traffic/TOC Meeting with IT	-	-	Quarterly	Interdepartmental coordination	Town Traffic Engineer	Information Technology and TOC Staff

August							
Section	Item	Time	Frequency	Notes	Purpose	Initiator	Participants
General	TOC Staff Meeting	-	-	Weekly	Planning and coordination	TOC	Town TOC Staff
	Traffic Staff Meeting	-	-	Weekly	Planning and coordination	Town Traffic Engineer	Town Engineering Staff/TOC Staff
	Planning Meeting	2:00	Tuesdays	Weekly	Planning and coordination	Town Engineer	Town Transportation Planning Staff
	Review for CIP/TIP Projects	-	-	Annually	Funding and project planning	Gilbert Budget/Research	
	Research Competitive Grants	-	-	Twice per Year	Funding and project planning	Gilbert Budget/Research	
	Update/Review Involvement Calendar	-	-	Annually	Planning and coordination		
1st	MAG TIP Process - applications are open	-	1st week	Annually	Funding process	MAG	Town Traffic Engineer/ITS Engineer
	MAG Transit Committee Meeting	10-12	1st Mon	Monthly	Region involvement	MAG	Town Transportation Planning Staff
	Town Council Meeting	6:30	1st Tues	Twice Per Month	Planning and coordination	Town Council	Town Councilmembers and Other Staff
	MAG ITS Committee Meeting	10-12	1st Wed	Monthly	Region involvement	MAG	Town ITS Engineer
	Second in Command Meeting	-	1st Thurs	Monthly	Planning and coordination	Town Manager	Town Traffic Engineer
2nd	MAG TIP Process - working meetings for app development	-	2nd week	Annually	Funding process	MAG	Town Traffic Engineer/ITS Engineer
	TOC Meets with Signals Tech	-	-	Monthly	Planning and coordination	Town Traffic Engineer	Traffic Signal Specialists
	Supervisors Meeting	-	2nd Thurs	Monthly	Interdepartmental coordination	Town Manager	All Supervisors
	Public Works Meeting	-	-	Monthly	Interdepartmental coordination	Public Works Director	Public Works Staff
3rd	MAG Active Transportation Committee Meeting	1-3	3rd Tues	Monthly	Region involvement	MAG	Town Transportation Planning Staff
	Town Council Meeting	6:30	3rd Tues	Twice Per Month	Planning and coordination	Town Council	Town Councilmembers and Other Staff
	AZTech Operations Committee Meeting	9-11	3rd Wed	Monthly	Region involvement	MCDOT	Town ITS Engineer
	AZTech Strategic Steering Committee Meeting	2-4	3rd Thurs	Monthly	Region involvement	MCDOT	Town Traffic Engineer
4th	MAG Transportation Safety Committee Meeting	9-11	4th Tues	Monthly	Region involvement	MAG	Town Traffic Engineer
	CIP Meeting with Traffic/TOC	-	-	Monthly	Interdepartmental coordination	Town Traffic Engineer	CIP and TOC Staff

September							
Section	Item	Time	Frequency	Notes	Purpose	Initiator	
General	CIP Process - updating estimates and identify projects	-	Sept-Dec	Annually	Discuss comm plan and planning	Gilbert Budget/Research	Town Engineer/Town Traffic Engineer
	TOC Staff Meeting	-	-	Weekly	Planning and coordination	TOC	Town TOC Staff
	Traffic Staff Meeting	-	-	Weekly	Planning and coordination	Town Traffic Engineer	Town Engineering Staff/TOC Staff
	Planning Meeting	2:00	Tuesdays	Weekly	Planning and coordination	Town Engineer	Town Transportation Planning Staff
1st	MAG Transit Committee Meeting	10-12	1st Mon	Monthly	Region involvement	MAG	Town Transportation Planning Staff
	Town Council Meeting	6:30	1st Tues	Twice Per Month	Planning and coordination	Town Council	Town Councilmembers and Other Staff
	MAG ITS Committee Meeting	10-12	1st Wed	Monthly	Region involvement	MAG	Town ITS Engineer
	Second in Command Meeting		1st Thurs	Monthly	Planning and coordination	Town Manager	Town Traffic Engineer
2nd	MAG TIP Process - project applications due	-	Mid month	Annually	Funding Process	MAG	Town Traffic Engineer/ITS Engineer
	AZTech TIM Coalition Meeting	10-12	2nd week	Every other month	Region involvement	MCDOT	Town Police and Fire Staff
	Executive Team Meeting	-	2nd Tues	Every Other Month	Interdepartmental coordination	Town Manager	Town Engineer
	TOC Meets with Signals Tech	-	-	Monthly	Planning and coordination	Town Traffic Engineer	Traffic Signal Specialists
	Supervisors Meeting	-	2nd Thurs	Monthly	Interdepartmental coordination	Town Manager	All Supervisors
	Public Works Meeting	-	-	Monthly	Interdepartmental coordination	Public Works Director	Public Works Staff
3rd	MAG Active Transportation Committee Meeting	1-3	3rd Tues	Monthly	Region involvement	MAG	Town Transportation Planning Staff
	Town Council Meeting	6:30	3rd Tues	Twice Per Month	Planning and coordination	Town Council	Town Councilmembers and Other Staff
	AZTech Operations Committee Meeting	9-11	3rd Wed	Monthly	Region involvement	MCDOT	Town ITS Engineer
	AZTech Strategic Steering Committee Meeting	2-4	3rd Thurs	Monthly	Region involvement	MCDOT	Town Traffic Engineer
4th	MAG Transportation Safety Committee Meeting	9-11	4th Tues	Monthly	Region involvement	MAG	Town Traffic Engineer
	CIP Meeting with Traffic/TOC	-	-	Monthly	Interdepartmental coordination	Town Traffic Engineer	CIP and TOC Staff

October							
Section	Item	Time	Frequency	Notes	Purpose	Initiator	Participants
General	CIP Process – updating estimates and identify projects	-	Sept-Dec	Annually	Funding process	Gilbert Budget/Research	Town Engineer/Town Traffic Engineer
	TOC Staff Meeting	-	-	Weekly	Planning and coordination	TOC	Town TOC Staff
	Traffic Staff Meeting	-	-	Weekly	Planning and coordination	Town Traffic Engineer	Town Engineering Staff/TOC Staff
	Planning Meeting	2:00	Tuesdays	Weekly	Planning and coordination	Town Engineer	Town Transportation Planning Staff
	Update/Review SOP's	-	-	Quarterly	Keep SOP's up-to-date	Town Traffic Engineer	
1st	MAG TIP Process – present ITS projects to ITS Committee	-	1st week	Annually	Funding process	MAG	Town Traffic Engineer/ITS Engineer
	MAG Transit Committee Meeting	10-12	1st Mon	Monthly	Region involvement	MAG	Town Transportation Planning Staff
	Town Council Meeting	6:30	1st Tues	Twice Per Month	Planning and coordination	Town Council	Town Councilmembers and Other Staff
	MAG ITS Committee Meeting	10-12	1st Wed	Monthly	Region involvement	MAG	Town ITS Engineer
	Second in Command Meeting	-	1st Thurs	Monthly	Planning and coordination	Town Manager	Town Traffic Engineer
2nd	TOC Meets with Signals Tech	-	-	Monthly	Planning and coordination	Town Traffic Engineer	Traffic Signal Specialists
	Supervisors Meeting	-	2nd Thurs	Monthly	Interdepartmental coordination	Town Manager	All Supervisors
	Public Works Meeting	-	-	Monthly	Interdepartmental coordination	Public Works Director	Public Works Staff
3rd	MAG TIP Process – present bike/ped projects	-	3rd week	Annually	Funding process	MAG	Town Traffic Engineer/ITS Engineer
	MAG Active Transportation Committee Meeting	1-3	3rd Tues	Monthly	Region involvement	MAG	Town Transportation Planning Staff
	Town Council Meeting	6:30	3rd Tues	Twice Per Month	Planning and coordination	Town Council	Town Councilmembers and Other Staff
	AZTech Operations Committee Meeting	9-11	3rd Wed	Monthly	Region involvement	MCDOT	Town ITS Engineer
	AZTech Strategic Steering Committee Meeting	2-4	3rd Thurs	Monthly	Region involvement	MCDOT	Town Traffic Engineer
4th	MAG Transportation Safety Committee Meeting	9-11	4th Tues	Monthly	Region involvement	MAG	Town Traffic Engineer
	CIP Meeting with Traffic/TOC	-	-	Monthly	Interdepartmental coordination	Town Traffic Engineer	CIP and TOC Staff
	Fire/PD/Traffic Meeting	-	-	Quarterly	Interdepartmental coordination	Town Traffic Engineer	Fire and PD Staff
	Development Service/Traffic Meeting	-	-	Quarterly	Interdepartmental coordination	Town Traffic Engineer	Development Services Staff
	Traffic/TOC Meeting with IT	-	-	Quarterly	Interdepartmental coordination	Town Traffic Engineer	Information Technology and TOC Staff

November							
Section	Item	Time	Frequency	Notes	Purpose	Initiator	Participants
General	CIP Process – updating estimates and identify projects	-	Sept-Dec	Annually	Funding process	Gilbert Budget/Research	Town Engineer/Town Traffic Engineer
	TOC Staff Meeting	-	-	Weekly	Planning and coordination	TOC	Town TOC Staff
	Traffic Staff Meeting	-	-	Weekly	Planning and coordination	Town Traffic Engineer	Town Engineering Staff/TOC Staff
	Planning Meeting	2:00	Tuesdays	Weekly	Planning and coordination	Town Engineer	Town Transportation Planning Staff
1st	MAG TIP Process – project rankings due	-	1st week	Annually	Funding process	MAG	Town Traffic Engineer/ITS Engineer
	MAG Transit Committee Meeting	10-12	1st Mon	Monthly	Region involvement	MAG	Town Transportation Planning Staff
	Town Council Meeting	6:30	1st Tues	Twice Per Month	Planning and coordination	Town Council	Town Councilmembers and Other Staff
	MAG ITS Committee Meeting	10-12	1st Wed	Monthly	Region involvement	MAG	Town ITS Engineer
	Second in Command Meeting	-	1st Thurs	Monthly	Planning and coordination	Town Manager	Town Traffic Engineer
2nd	AZTech TIM Coalition Meeting	10-12	2nd Tues	Every Other Month	Region involvement	MCDOT	Town Police and Fire Staff
	Executive Team Meeting	-	2nd Tues	Every Other Month	Interdepartmental coordination	Town Manager	Town Engineer
	TOC Meets with Signals Tech	-	-	Monthly	Planning and coordination	Town Traffic Engineer	Traffic Signal Specialists
	Supervisors Meeting	-	2nd Thurs	Monthly	Interdepartmental coordination	Town Manager	All Supervisors
	Public Works Meeting	-	-	Monthly	Interdepartmental coordination	Public Works Director	Public Works Staff
3rd	MAG Active Transportation Committee Meeting	1-3	3rd Tues	Monthly	Region involvement	MAG	Town Transportation Planning Staff
	Town Council Meeting	6:30	3rd Tues	Twice Per Month	Planning and coordination	Town Council	Town Councilmembers and Other Staff
	AZTech Operations Committee Meeting	9-11	3rd Wed	Monthly	Region involvement	MCDOT	Town ITS Engineer
	AZTech Strategic Steering Committee Meeting	2-4	3rd Thurs	Monthly	Region involvement	MCDOT	Town Traffic Engineer
4th	MAG Transportation Safety Committee Meeting	9-11	4th Tues	Monthly	Region involvement	MAG	Town Traffic Engineer
	CIP Meeting with Traffic/TOC	-	-	Monthly	Interdepartmental coordination	Town Traffic Engineer	CIP and TOC Staff

December							
Section	**Item**	**Time**	**Frequency**	**Notes**	**Purpose**	**Initiator**	**Participants**
General	CIP Process – submit proposals for new or updates services	-	Dec-Jan	Annually	Funding process	Gilbert Budget/Research	Town Engineer/Town Traffic Engineer
	TOC Staff Meeting	-	-	Weekly	Planning and coordination	TOC	Town TOC Staff
	Traffic Staff Meeting	-	-	Weekly	Planning and coordination	Town Traffic Engineer	Town Engineering Staff/TOC Staff
	Planning Meeting	2:00	Tuesdays	Weekly	Planning and coordination	Town Engineer	Town Transportation Planning Staff
1st	MAG Transit Committee Meeting	10-12	1st Mon	Monthly	Region involvement	MAG	Town Transportation Planning Staff
	Town Council Meeting	6:30	1st Tues	Twice Per Month	Planning and coordination	Town Council	Town Councilmembers and Other Staff
	MAG ITS Committee Meeting	10-12	1st Wed	Monthly	Region involvement	MAG	Town ITS Engineer
	Second in Command Meeting		1st Thurs	Monthly	Planning and coordination	Town Manager	Town Traffic Engineer
2nd	TOC Meets with Signals Tech	-		Monthly	Planning and coordination	Town Traffic Engineer	Traffic Signal Specialists
	Supervisors Meeting	-	2nd Thurs	Monthly	Interdepartmental coordination	Town Manager	All Supervisors
	Public Works Meeting	-		Monthly	Interdepartmental coordination	Public Works Director	Public Works Staff
3rd	MAG Active Transportation Committee Meeting	1-3	3rd Tues	Monthly	Region Involvement	MAG	Town Transportation Planning Staff
4th	Holiday/Vacation	-	-	-	-	-	-